



**DEPARTMENT OF THE AIR FORCE
HEADQUARTERS ARNOLD ENGINEERING DEVELOPMENT CENTER (AFMC)
ARNOLD AIR FORCE BASE TENNESSEE**

May 30, 2001

MEMORANDUM FOR: All Prospective Offerors

FROM: AEDC/PKP
100 Kindel Drive, Suite A-332
Arnold AFB TN 37389-2312

SUBJECT: Solicitation F40650-00-R-0010, Variable Frequency Starting System

1. Attached is the solicitation for the Variable Frequency Starting System for the Engine Test Facility C-Plant. The solicitation documents include:

The proposed contract (pages 1-9 of 42)
Solicitation Instructions, including Representations and Certifications (pages 10-27 of 42)
Evaluation Of Proposals (pages 28-32 of 42)
Proposal Preparation Instructions (pages 33-42 of 42)
Specification (Contract/Solicitation Attachment 1) 125 Pages
Performance Information Format (Solicitation Attachment 2) 2 Pages

2. You should read all portions of the solicitation carefully. The specification defines our minimum technical requirements that must be met by the successful contractor. The proposal preparation instructions include direction regarding format and specific information that must be included in your proposal. The evaluation of proposals section defines the criteria and process that we will use to evaluate your proposal.

3. Foreign nationals or representatives of foreign companies may not visit AEDC without prior approval. Please see AFMC FAR Supplement 5352.227-9002, VISIT REQUESTS BY FOREIGN OWNED OR CONTROLLED FIRMS in the solicitation.

4. If you have any questions, please call me at (931) 454-7844 or email me at rick.stewart@arnold.af.mil.

W. RICHARD STEWART
Contracting Officer

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30				1. REQUISITION NUMBER		PAGE 1 OF 42	
2. CONTRACT NO.		3. AWARD/EFFECTIVE DATE		4. ORDER NUMBER		5. SOLICITATION NUMBER F40650-00-R-0010	
7. FOR SOLICITATION INFORMATION CALL:		a. NAME Rick Stewart				b. TELEPHONE NUMBER (No collect calls) 931-454-7844	
9. ISSUED BY AEDC PKP AF PROCUREMENT BRANCH 100 KINDEL DRIVE, SUITE A-1332 ARNOLD AFB TN 37389-1332 Rick Stewart (931)454-7844 Rick.stewart@arnold.af.mil		10. THIS ACQUISITION IS <input checked="" type="checkbox"/> UNRESTRICTED <input type="checkbox"/> SET ASIDE: % FOR <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> SMALL DISADV. BUSINESS SIC: 335311 SIZE STANDARD: 750		11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED <input type="checkbox"/> SEE SCHEDULE		6. SOLICITATION ISSUE DATE 30 May 2001	
				13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) <input checked="" type="checkbox"/>		8. OFFER DUE DATE/ LOCAL TIME 16 July 2001/ 2:00 PM	
				14. METHOD OF SOLICITATION <input type="checkbox"/> RFQ <input type="checkbox"/> IFB <input checked="" type="checkbox"/> RFP		12. DISCOUNT TERMS	
15. DELIVER TO SEE DELIVERY SCHEDULE		16. ADMINISTERED BY See Block 9					
17a. CONTRACTOR/ OFFEROR TELEPHONE NO.		18a. PAYMENT WILL BE MADE BY DFAS-DY/FV 1050 Forrer Blvd Dayton OH 45420-1472 EFT:T					
<input type="checkbox"/> 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER		18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a. UNLESS BLOCK BELOW IS CHECKED <input type="checkbox"/> SEE ADDENDUM					
19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES			21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT
25. ACCOUNTING AND APPROPRIATION DATA						26. TOTAL AWARD AMOUNT (For Govt. Use Only)	
<input checked="" type="checkbox"/> 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA <input checked="" type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED. <input type="checkbox"/> 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52.212-5 IS ATTACHED. ADDENDA <input type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED.							
28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN <input type="checkbox"/> TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED HEREIN.				29. AWARD OF CONTRACT: REFERENCE <input type="checkbox"/> OFFER DATED <input type="checkbox"/> . YOUR OFFER SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, IS ACCEPTED AS TO ITEMS:			
30a. SIGNATURE OF OFFEROR/CONTRACTOR				31a. UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)			
30b. NAME AND TITLE OF SIGNER			30c. DATE SIGNED	31b. NAME OF CONTRACTING OFFICER			31c. DATE SIGNED
32a. QUANTITY IN COLUMN 21 HAS BEEN <input type="checkbox"/> RECEIVED <input type="checkbox"/> INSPECTED <input type="checkbox"/> ACCEPTED. AND CONFORMS TO THE CONTRACT, EXCEPT AS NOTED				33. SHIP NUMBER <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL		34. VOUCHER NUMBER	35. AMOUNT VERIFIED CORRECT FOR
32b. SIGNATURE OF AUTHORIZED GOVT. REPRESENTATIVE			32c. DATE	36. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL		37. CHECK NUMBER	
41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT				38. S/R ACCOUNT NUMBER		39. S/R VOUCHER NUMBER	40. PAID BY
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER			41c. DATE	42a. RECEIVED BY (Print)			
				42b. RECEIVED AT (Location)			
				42c. DATE REC'D (YY/MM/DD)		42d. TOTAL CONTAINERS	

<u>Item</u>	<u>Supplies or Services</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
Replacement Of The Variable Frequency Starting Systems for the Engine Test Facility C-Plant Consisting of the Following Items:					
0001	Base Item – Design for fabrication and installation of both units. Fabrication and delivery of the first unit.	1	Lot	\$	\$
0002	Option Item 1- Demolition, installation and check out of the first unit	1	Lot	\$	\$
0003	Option Item 2- Fabrication of the second unit.	1	Lot	\$	\$
0004	Option Item 3- Demolition, installation and check out of the second unit	1	Lot	\$	\$

All items shall be in accordance with Attachment 1, Specification 4917-01, dated February 2001, Replacement of Variable Frequency Starting System for the Engine Test Facility C-Plant

Items 0001-0004 assume that full funding will be not be available at the time of contract award. The Government reserves the right to delay award of any options until Fiscal Years 02, 03 or 04 (FY 02 begins Oct 1 2001 and ends Sept 30 2002). Offerors must provide pricing which supports this phased funding approach.

Offerors are encouraged to propose an alternate pricing structure which assumes that all funding will be available at contract award, however any such alternate must include a phased installation approach which ensures one complete system is operational before beginning demolition of the second system.

Performance Period:

All work under this contract shall be performed in accordance with the following schedule:

0001	Base Item – Design for fabrication and installation of both units. Procurement and delivery of the first unit.	1	Lot
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Within _____ calendar days after receiving written notice of contract award.

0002	Option Item - Demolition, installation and check out of the first unit (3-month completion window), plus 7-month system reliability demonstration period.	1	Lot
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Within _____ calendar days after receiving written notice to proceed for the on-site work

0003	Option Item - Procurement of the second unit.	1	Lot
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Within _____ calendar days after receiving written notice of exercise of option.

0004	Option Item - Demolition, installation and check out of the second unit (3-month completion window)	1	Lot
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Within _____ calendar days after receiving written notice to proceed for the onsite work.

Note: Offerors shall enter their proposed schedule above.

1. 52.212-04 ADDENDUM TO CONTRACT TERMS AND CONDITIONS--COMMERCIAL ITEMS (May 1999)

52.212-4, Contract Terms and Conditions -- Commercial Items is hereby tailored as follows:

(a) The place of inspection, acceptance, and FOB is Arnold AFB, TN .

(more tailoring of 52.212-4)

2. 52.212-05 CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS--COMMERCIAL ITEMS (Aug 2000)

(a) The Contractor shall comply with the following FAR clauses, which are incorporated in this contract by reference, to implement provisions of law or executive orders applicable to acquisitions of commercial items:

(1) 52.222-3, Convict Labor (E.O. 11755);

(2) 52.233-3, Protest after Award (31 U.S.C 3553).

(b) The Contractor shall comply with the FAR clauses in this paragraph (b) which the contracting officer has indicated as being incorporated in this contract by reference to implement provisions of law or executive orders applicable to acquisitions of commercial items or components:

☒ (1) 52.203-6, Restrictions on Subcontractor Sales to the Government (Jul 1995), with Alternate I (Oct 1995) (41 U.S.C. 253g and 10 U.S.C. 2402).

☒ (3) 52.219-4, Notice of Price Evaluation Preference for HUBZone Small Business Concerns (Jan 1999). (If the offeror elects to waive the preference, it shall so indicate in its offer.)

☒ (5) 52.219-8, Utilization of Small Business Concerns (Oct 1999) (15 U.S.C. 637 (d)(2) and (3)).

☒ (11) 52.222-21, Prohibition of Segregated Facilities (Feb 1999).

☒ (12) 52.222-26, Equal Opportunity (FEB 1999)(E.O. 11246).

☒ (13) 52.222-35, Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era (Apr 1998) (38 U.S.C. 4212).

☒ (14) 52.222-36, Affirmative Action for Workers with Disabilities (Jun 1998) (29 U.S.C. 793).

☒ (15) 52.222-37, Employment Reports on Disabled Veterans and Veterans of the Vietnam Era (Jan 1999) (38 U.S.C. 4212).

☒ (17) 52.225-1, Buy American Act - Balance of Payments -- Supplies (Feb 2000) (41 U.S.C. 10a - 10d).

☒ (23) 52.232-33, Payment by Electronic Funds Transfer-Central Contractor Registration (May 1999) (31 U.S.C. 3332).

(c) The Contractor shall comply with the FAR clauses in this paragraph (c), applicable to commercial services, which the Contracting Officer has indicated as being incorporated in this contract by reference to implement provisions of law or executive orders applicable to acquisitions of commercial items or components:

(d) Comptroller General Examination of Record. The Contractor agrees to comply with the provisions of this paragraph (d) if this contract was awarded using other than sealed bid, is in excess of the simplified acquisition threshold, and does not contain the clause at 52.215-2, Audit and Records -- Negotiation.

(1) The Comptroller General of the United States, or an authorized representative of the Comptroller General, shall have access to and right to examine any of the Contractor's directly pertinent records involving transactions related to this contract.

(2) The Contractor shall make available at its offices at all reasonable times the records, materials, and other evidence for examination, audit, or reproduction, until 3 years after final payment under this contract or for any shorter period specified in FAR Subpart 4.7, Contractor Records Retention, of the other clauses of this contract. If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement. Records relating to appeals under the disputes clause or to litigation or the settlement of claims

arising under or relating to this contract shall be made available until such appeals, litigation, or claims are finally resolved.

(3) As used in this clause, records include books, documents, accounting procedures and practices, and other data, regardless of type and regardless of form. This does not require the Contractor to create or maintain any record that the Contractor does not maintain in the ordinary course of business or pursuant to a provision of law.

(e) Notwithstanding the requirements of the clauses in paragraphs (a), (b), (c) or (d) of this clause, the Contractor is not required to include any FAR clause, other than those listed below (and as may be required by an addenda to this paragraph to establish the reasonableness of prices under Part 15), in a subcontract for commercial items or commercial components --

(1) 52.222-26, Equal Opportunity (E.O.11246);

(2) 52.222-35, Affirmative Action for Disabled Veterans and Veterans of the Vietnam Era (38 U.S.C.4212);

(3) 52.222-36, Affirmative Action for Workers with Disabilities (29 U.S.C.793); and

(4) 52.247-64, Preference for Privately-Owned U.S.- Flagged Commercial Vessels (46 U.S.C.1241) (flowdown not required for subcontracts awarded beginning May 1, 1996).

(5) 52.222-41, Service Contract Act of 1965, As Amended (41 U.S.C. 351, et. seq.).

3. 252.212-7001 CONTRACT TERMS AND CONDITIONS REQUIRED TO IMPLEMENT STATUTES OR EXECUTIVE ORDERS APPLICABLE TO DEFENSE ACQUISITIONS OF COMMERCIAL ITEMS (Dec 2000)

(a) The Contractor agrees to comply with any clause that is checked on the following list of DFARS clauses which, if checked, is included in this contract by reference to implement provisions of law or Executive orders applicable to acquisitions of commercial items or components.

☒ 252.205-7000 Provision of Information to Cooperative Agreement Holders (Dec 1991) (10 U.S.C. 2416).

☒ 252.219-7003 Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DOD Contracts) (Apr 1996) (15 U.S.C. 637).

☒ 252.225-7007 Buy American Act--Trade Agreements--Balance of Payments Program (Mar 1998) (41 U.S.C. 10a-10d, 19 U.S.C. 2501-2518, and 19 U.S.C. 3301 note).

☒ 252.225-7012 Preference for Certain Domestic Commodities (May 1999).

☒ 252.227-7015 Technical Data--Commercial Items (Nov 1995) (10 U.S.C. 2320).

☒ 252.243-7002 Requests for Equitable Adjustment (Mar 1998) (10 U.S.C. 2410).

☒ 252.247-7023 Transportation of Supplies by Sea (Mar 2000) (10 U.S.C. 2631).

☒ 252.247-7023 Transportation of Supplies by Sea (Mar 2000) - Alternate I (Mar 2000) (10 U.S.C. 2631).

(b) In addition to the clauses listed in paragraph (e) of the Contract Terms and Conditions Required to Implement Statutes or Executive Orders--Commercial Items clause of this contract (Federal Acquisition Regulation 52.212-5), the Contractor shall include the terms of the following clauses, if applicable, in subcontracts for commercial items or commercial components, awarded at any tier under this contract:

252.225-7014 Preference for Domestic Specialty Metals, Alternate I (10 U.S.C. 2241 note).

252.247-7023 Transportation of Supplies by Sea (10 U.S.C. 2631).

252.247-7024 Notification of Transportation of Supplies by Sea (10 U.S.C. 2631).

4. 52.217-7 Option for Increased Quantity -- Separately Priced Line Item (Mar 1989)

The Government may require the delivery of the numbered line item, identified in the Schedule as an option item, in the quantity and at the price stated in the

Schedule. The Contracting Officer may exercise the option by written notice to the Contractor within three years after the date of contract award. Delivery of added items shall continue at the same rate that like items are called for under the contract, unless the parties otherwise agree.

5. 52.228-5 -- Insurance -- Work on a Government Installation. (Jan 1997)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance of this contract, at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract.

(b) Before commencing work under this contract, the Contractor shall notify the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective --

(1) For such period as the laws of the State in which this contract is to be performed prescribe; or

(2) Until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

6. 5352.228-9001 Insurance Clause Implementation (AFMC) (JUL 1997)

The Contractor shall obtain and maintain the minimum kinds and amounts of insurance during performance of this contract as specified by FAR 28.307-2, Liability, and contemplated by FAR 52.228-5, Insurance--Work on a Government Installation, and/or 52.228-7, Insurance--Liability to Third Persons

7. 5352.225-9001 English Language Requirements. (AFMC) (JUL 1997)

(a) Deliver all documents in the English language.

(b) Provide an English language speaking person during in-plant visits, inspections, reviews, audits, and other similar activities.

8. 5352.227-9002 Visit Requests By Foreign Owned Or Controlled Firms (AFMC) (JUL 1997)

(a) Prime Contractors which are foreign-owned or controlled and require access to a U.S. Government installation shall submit visit requests through their foreign embassy in Washington, D.C. at least 30 days prior to the proposed visit date.

(b) Subcontractors which are foreign-owned or controlled and require access to

a U.S. Government installation shall have their prime Contractor submit a visit request to the security police office of the base being visited at least two weeks before the scheduled meeting.

(c) Canadian Contractors and Canadian government employees may directly arrange visits by having their security office submit a visit request to the security policy office of the base being visited at least two weeks before the scheduled meeting.

A. FEDERAL ACQUISITION REGULATION SOLICITATION PROVISIONS IN FULL TEXT

52.212-01 INSTRUCTIONS TO OFFERORS--COMMERCIAL ITEMS (OCT 2000)

(a) North American Industry Classification System (NAICS) code and small business size standard. The NAICS code and small business size standard for this acquisition appear in Block 10 of the solicitation cover sheet (SF 1449). However, the small business size standard for a concern which submits an offer in its own name, but which proposes to furnish an item which it did not itself manufacture, is 500 employees.

(b) Submission of offers. Submit signed and dated offers to the office specified in this solicitation at or before the exact time specified in this solicitation. Offers may be submitted on the SF 1449, letterhead stationery, or as otherwise specified in the solicitation. As a minimum, offers must show --

(1) The solicitation number;

(2) The time specified in the solicitation for receipt of offers;

(3) The name, address, and telephone number of the offeror;

(4) A technical description of the items being offered in sufficient detail to evaluate compliance with the requirements in the solicitation. This may include product literature, or other documents, if necessary;

(5) Terms of any express warranty;

(6) Price and any discount terms;

(7) "Remit to" address, if different than mailing address;

(8) A completed copy of the representations and certifications at FAR 52.212-3;

(9) Acknowledgment of Solicitation Amendments;

(10) Past performance information, when included as an evaluation factor, to include recent and relevant contracts for the same or similar items and other references (including contract numbers, points of contact with telephone numbers and other relevant information); and

(11) If the offer is not submitted on the SF 1449, include a statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation. Offers that fail to furnish required representations or information, or reject the terms and conditions of the solicitation may be excluded from consideration.

(c) Period for acceptance of offers. The offeror agrees to hold the prices in its offer firm for 30 calendar days from the date specified for receipt of offers, unless another time period is specified in an addendum to the solicitation.

(d) Product samples. When required by the solicitation, product samples shall be submitted at or prior to the time specified for receipt of offers. Unless otherwise specified in this solicitation, these samples shall be submitted at no expense to the Government, and returned at the sender's request and expense, unless they are destroyed during preaward testing.

(e) Multiple offers. Offerors are encouraged to submit multiple offers presenting alternative terms and conditions or commercial items for satisfying the requirements of this solicitation. Each offer submitted will be evaluated separately.

(f) Late submissions, modifications, revisions, and withdrawals of offers.

(1) Offerors are responsible for submitting offers, and any modifications, revisions, or withdrawals, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that offers or revisions are due.

(2)

(i) Any offer, modification, revision, or withdrawal of an offer received at the Government office designated in the solicitation after the exact time specified for receipt of offers is "late" and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and-

(A) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of offers; or

(B) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(C) If this solicitation is a request for proposals, it was the only proposal received.

(ii) However, a late modification of an otherwise successful offer, that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(3) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the offer wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(4) If an emergency or unanticipated event interrupts normal Government processes so that offers cannot be received at the Government office designated for receipt of offers by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation or other notice of an extension of the closing date, the time specified for receipt of offers will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(5) Offers may be withdrawn by written notice received at any time before the exact time set for receipt of offers. Oral offers in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile offers, offers may be withdrawn via facsimile received at any time before the exact time set for receipt of offers, subject to the conditions specified in the solicitation concerning facsimile offers. An offer may be withdrawn in person by an offeror or its authorized representative if, before the exact time set for receipt of offers, the identity of the person requesting withdrawal is established and the person signs a receipt for the offer.

(g) Contract award (not applicable to Invitation for Bids). The Government intends to evaluate offers and award a contract without discussions with offerors. Therefore, the offeror's initial offer should contain the offeror's best terms from a price and technical standpoint. However, the Government reserves the right to conduct discussions if later determined by the Contracting Officer to be necessary. The Government may reject any or all offers if such action is in the public interest; accept other than the lowest offer; and waive informalities and minor irregularities in offers received.

(h) Multiple awards. The Government may accept any item or group of items of an offer, unless the offeror qualifies the offer by specific limitations. Unless otherwise provided in the Schedule, offers may not be submitted for quantities less than those specified. The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit prices offered, unless the offeror specifies otherwise in the offer.

(i) Availability of requirements documents cited in the solicitation.

(1)

(i) The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29, and copies of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained for a fee by submitting a request to--

GSA Federal Supply Service Specifications Section

Suite 8100
470 L'Enfant Plaza, SW
Washington, DC 20407
Telephone (202) 619-8925)

Facsimile (202 619-8978).

(ii) If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (i)(1)(i) of this provision. Additional copies will be issued for a fee.

(2) The DoD Index of Specifications and Standards (DoDISS) and documents listed in it may be obtained from the--

Department of Defense Single Stock Point (DoDSSP)
Building 4, Section D

700 Robbins Avenue
Philadelphia, PA 19111-5094

Telephone (215) 697-2667/2179

Facsimile (215) 697-1462.

(i) Automatic distribution may be obtained on a subscription basis.

(ii) Order forms, pricing information, and customer support information may be obtained--

(A) By telephone at (215) 697-2667 / 2179; or

(B) Through the DoDSSP Internet site at <http://assist.daps.mil>.

(3) Nongovernment (voluntary) standards must be obtained from the organization responsible for their preparation, publication or maintenance.

(j) Data Universal Numbering System (DUNS) Number. (Applies to offers exceeding \$25,000.) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" followed by the DUNS number that identifies the offeror's name and address. If the offeror does not have a DUNS number, it should contact Dun and Bradstreet to obtain one at no charge. An offeror within the United States may call 1-800-333-0505. The offeror may obtain more information

regarding the DUNS number, including locations of local Dun and Bradstreet Information Services offices for offerors located outside the United States, from the Internet home page at <http://www.customerservice@dnb.com>. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

52.212-03 OFFEROR REPRESENTATIONS AND CERTIFICATIONS--COMMERCIAL ITEMS (JAN 2001) - ALTERNATE I (OCT 2000)

(a) Definitions. As used in this provision:

"Emerging small business" means a small business concern whose size is no greater than 50 percent of the numerical size standard for the NAICS code designated.

"Service-disabled veteran-owned small business concern" -

(1) Means a small business concern-

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern" means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and size standards in this solicitation.

"Veteran-owned small business concern" means a small business concern-

(1) Not less than 51 percent of which is owned by one or more veterans(as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern" means a small business concern--

(1) Which is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

"Women-owned business concern" means a concern which is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Taxpayer Identification Number (TIN) (26 U.S.C. 6109, 31 U.S.C. 7701). (Not applicable if the offeror is required to provide this information to a central contractor registration database to be eligible for award.)

(1) All offerors must submit the information required in paragraphs (b)(3) through (b)(5) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the Internal Revenue Service (IRS).

(2) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(3) Taxpayer Identification Number (TIN).

☐ TIN:-----

☐ TIN has been applied for.

☐ TIN is not required because:

☐ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

☐ Offeror is an agency or instrumentality of a foreign government;

☐ Offeror is an agency or instrumentality of the Federal Government.

(4) Type of organization.

☐ Sole proprietorship;

- ☐ Partnership;
- ☐ Corporate entity (not tax-exempt);
- ☐ Corporate entity (tax-exempt);
- ☐ Government entity (Federal, State, or local);
- ☐ Foreign government;
- ☐ International organization per 26 CFR 1.6049-4;
- ☐ Other _____

(5) Common parent.

- ☐ Offeror is not owned or controlled by a common parent;

- ☐ Name and TIN of common parent:

Name _____

TIN _____

(c) Offerors must complete the following representations when the resulting contract is to be performed inside the United States, its territories or possessions, Puerto Rico, the Trust Territory of the Pacific Islands, or the District of Columbia. Check all that apply.

(1) Small business concern. The offeror represents as part of its offer that it ☐ is, ☐ is not a small business concern.

(2) Veteran-owned small business concern. (Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.) The offeror represents as part of its offer that it ☐ is, ☐ is not a veteran-owned small business concern.

(3) Service-disabled veteran-owned small business concern. (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (c)(2) of this provision.) The offeror represents as part of its offer that it ☐ is, ☐ is not a service-disabled veteran-owned small business concern.

(4) Small disadvantaged business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents, for general statistical purposes, that it ☐ is, ☐ is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(5) Women-owned small business concern. [Complete only if the offeror represented itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents that it ☐ is, ☐ is not a women-owned small business concern.

Note: Complete paragraphs (c)(6) and (c)(7) only if this solicitation is expected to exceed the simplified acquisition threshold.

(6) Women-owned business concern (other than small business concern). [Complete only if the offeror is a woman-owned business concern and did not represent itself as a small business concern in paragraph (c)(1) of this provision.] The offeror represents that it ☐ is a women-owned business concern.

(7) Tie bid priority for labor surplus area concerns. If this is an invitation for bid, small business offerors may identify the labor surplus areas in which costs to be incurred on account of manufacturing or production (by offeror or first-tier subcontractors) amount to more than 50 percent of the contract price:

(8) Small Business Size for the Small Business Competitiveness Demonstration Program and for the Targeted Industry Categories under the Small Business Competitiveness Demonstration Program. [Complete only if the offeror has represented itself to be a small business concern under the size standards for this solicitation.]

(i) (Complete only for solicitations indicated in an addendum as being set-aside for emerging small businesses in one of the four designated industry groups (DIGs).) The offeror represents as part of its offer that it ☐ is, ☐ is not an emerging small business.

(ii) (Complete only for solicitations indicated in an addendum as being for one of the targeted industry categories (TICs) or four designated industry groups (DIGs).) Offeror represents as follows:

(A) Offeror's number of employees for the past 12 months (check the Employees column if size standard stated in the solicitation is expressed in terms of number of employees); or

(B) Offeror's average annual gross revenue for the last 3 fiscal years (check the Average Annual Gross Number of Revenues column if size standard stated in the solicitation is expressed in terms of annual receipts).

(Check one of the following):

Number of Employees Average Annual Gross Revenues

☐ 50 or fewer ☐ \$1 million or less

___ 51 - 100 ___ \$1,000,001 - \$2 million

___ 101 - 250 ___ \$2,000,001 - \$3.5 million

___ 251 - 500 ___ \$3,500,001 - \$5 million

___ 501 - 750 ___ \$5,000,001 - \$10 million

___ 751 - 1,000 ___ \$10,000,001 - \$17 million

___ Over 1,000 ___ Over \$17 million

(9) (Complete only if the solicitation contains the clause at FAR 52.219-23, Notice of Price Evaluation Adjustment for Small Disadvantaged Business Concerns, or FAR 52.219-25, Small Disadvantaged business participation Program--Disadvantaged Status and Reporting, and the offeror desires a benefit based on its disadvantaged status.)

(i) General. The offeror represents that either--

(A) It [] is, [] is not certified by the Small Business Administration as a small disadvantaged business concern and identified, on the date of this representation, as a certified small disadvantaged business concern in the database maintained by the Small Business Administration (PRO-Net), and that no material change in disadvantaged ownership and control has occurred since its certification, and, where the concern is owned by one or more individuals claiming disadvantaged status, the net worth of each individual upon whom the certification is based does not exceed \$750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); or

(B) It [] has, [] has not submitted a completed application to the Small Business Administration or a Private Certifier to be certified as a small disadvantaged business concern in accordance with 13 CFR 124, Subpart B, and a decision on that application is pending, and that no material change in disadvantaged ownership and control has occurred since its application was submitted.

(ii) Joint Ventures under the Price Evaluation Adjustment for Small Disadvantaged Business Concerns. The offeror represents, as part of its offer, that it is a joint venture that complies with the requirements in 13 CFR 124.1002(f) and that the representation in paragraph (c)(7)(i) of this provision is accurate for the small disadvantaged business concern that is participating in the joint venture. [The offeror shall enter the name of the small disadvantaged business concern that is participating in the joint venture: _____.]

(d) Representations required to implement provisions of Executive Order 11246--

(1) Previous Contracts and Compliance. The offeror represents that--

(i) It ☐ has, ☐ has not, participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation; and

(ii) It ☐ has, ☐ has not, filed all required compliance reports.

(2) Affirmative Action Compliance. The offeror represents that--

(i) It ☐ has developed and has on file, ☐ has not developed and does not have on file, at each establishment, affirmative action programs required by rules and regulations of the Secretary of Labor (41 CFR Parts 60-1 and 60-2), or

(ii) It ☐ has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(e) Certification Regarding Payments to Influence Federal Transactions (31 U.S.C. 1352). (Applies only if the contract is expected to exceed \$100,000.) By submission of its offer, the offeror certifies to the best of its knowledge and belief that no Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with the award of any resultant contract.

(f) Buy American Act--Balance of Payments Program Certificate. (Applies only if the clause at Federal Acquisition Regulation (FAR) 52.225-1, Buy American Act--Balance of Payments Program--Supplies, is included in this solicitation.)

(1) The offeror certifies that each end product, except those listed in paragraph (f)(2) of this provision, is a domestic end product as defined in the clause of this solicitation entitled "Buy American Act--Balance of Payments Program--Supplies" and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States. The offeror shall list as foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

(2) Foreign End Products:

LINE ITEM NO COUNTRY OF ORIGIN

___ List line item numbers and country of origin as applicable.

(3) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(g).

(1) Buy American Act--North American Free Trade Agreement--Israeli Trade Act--Balance of Payments Program Certificate (Applies only if the clause at FAR 52.225-3, Buy American Act--North American Free Trade Agreement--Israeli Trade Act--Balance of Payments Program, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(1)(ii) or (g)(1)(iii) of this provision, is a domestic end product as defined in the clause of this solicitation entitled "Buy American Act--North American Free Trade Agreements--Israeli Trade Act--Balance of Payments Program" and that the offeror has considered components of unknown origin to have been mined, produced, or manufactured outside the United States.

(ii) The offeror certifies that the following supplies are NAFTA country end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act--North American Free Trade Agreement--Israeli Trade Act--Balance of Payments Program":

NAFTA Country or Israeli End Products

LINE ITEM NO COUNTRY OF ORIGIN

___Insert line item numbers and country of origin, as applicable

(iii) The offeror shall list those supplies that are foreign end products (other than those listed in paragraph (g)(1)(ii) of this provision) as defined in the clause of this solicitation entitled "Buy American Act--North American Free Trade Agreement--Israeli Trade Act--Balance of Payments Program." The offeror shall list as other foreign end products those end products manufactured in the United States that do not qualify as domestic end products.

Other Foreign End Products

LINE ITEM NO COUNTRY OF ORIGIN

___Insert line item numbers and country of origin, as applicable.

(iv) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25.

(2) Buy American Act--North American Free Trade Agreements--Israeli Trade Act--Balance of Payments Program Certificate, Alternate I (Feb 2000). If Alternate I to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)

(ii) The offeror certifies that the following supplies are Canadian end products as defined in the clause of this solicitation entitled "Buy American Act-North American Free Trade Agreement-Israeli Trade Act-Balance of Payments Program":

Canadian End Products

Line Item No.: _____

[List as necessary]

(3) Buy American Act-North American Free Trade Agreements-Israeli Trade Act-Balance of Payments Program Certificate, Alternate II (Feb 2000). If Alternate II to the clause at FAR 52.225-3 is included in this solicitation, substitute the following paragraph (g)(1)(ii) for paragraph (g)(1)(ii) of the basic provision:

(g)(1)(ii) The offeror certifies that the following supplies are Canadian end products or Israeli end products as defined in the clause of this solicitation entitled "Buy American Act--North American Free Trade Agreement--Israeli Trade Act--Balance of Payments Program":

Canadian or Israeli End Products

Line Item No.: Country of Origin:

___ [List as necessary]

(4) Trade Agreements Certificate. (Applies only if the clause at FAR 52.225-5, Trade Agreements, is included in this solicitation.)

(i) The offeror certifies that each end product, except those listed in paragraph (g)(4)(ii) of this provision, is a U.S.-made, designated country, Caribbean Basin country, or NAFTA country end product, as defined in the clause of this solicitation entitled "Trade Agreements."

(ii) The offeror shall list as other end products those end products that are not U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products.

Other End Products

Line Item No.: Country of Origin:

___ [List as necessary]

(iii) The Government will evaluate offers in accordance with the policies and procedures of FAR Part 25. For line items subject to the Trade Agreements

Act, the Government will evaluate offers of U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products without regard to the restrictions of the Buy American Act or the Balance of Payments Program. The Government will consider for award only offers of U.S.-made, designated country, Caribbean Basin country, or NAFTA country end products unless the Contracting Officer determines that there are no offers for such products or that the offers for such products are insufficient to fulfill the requirements of the solicitation.

(h) Certification Regarding Debarment, Suspension or Ineligibility for Award (Executive Order 12549). (Applies only if the contract value is expected to exceed the simplified acquisition threshold.) The offeror certifies, to the best of its knowledge and belief, that --

(1) The offeror and/or any of its principals [] are, [] are not presently debarred, suspended, proposed for debarment, or declared ineligible for the award of contracts by any Federal agency;

(2) [] Have, [] have not, within the three-year period preceding this offer, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a Federal, state or local government contract or subcontract; violation of Federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, or receiving stolen property;

(3) [] Are, [] are not presently indicted for, or otherwise criminally or civilly charged by a government entity with, commission of any of these offenses; and

(4)(i) The offeror, aside from the offenses enumerated in paragraphs (1), (2), and (3) of this paragraph (h), [] has [] has not within the past three years, relative to tax, labor and employment, environmental, antitrust, or consumer protection laws--

(A) Been convicted of a Federal or state felony (or has any Federal or state felony indictments currently pending against them); or

(B) Had a Federal court judgment in a civil case brought by the United States rendered against them; or

(C) Had an adverse decision by a Federal administrative law judge, board, or commission indicating a willful violation of law.

(ii) If the offeror has responded affirmatively, the offeror shall provide additional information if requested by the Contracting Officer.

Alternate I (Oct 2000). As prescribed in 12.301(b)(2), add the following paragraph (c)(10) to the basic provision:

(10) (Complete if the offeror has represented itself as disadvantaged in paragraph (c)(2) or (c)(7) of this provision.) The offeror shall check the category in which its ownership falls:

☐ Black American.

☐ Hispanic American.

☐ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).

☐ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory or the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).

☐ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).

☐ Individual/concern, other than one of the preceding.

B. DEFENSE FAR SUPP SOLICITATION PROVISIONS IN FULL TEXT

252.212-7000 OFFEROR REPRESENTATIONS AND CERTIFICATIONS--COMMERCIAL ITEMS (NOV 1995)

(a) Definitions. As used in this clause--

(1) "Foreign person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. App. Sec. 2415).

(2) "United States person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concern, as determined under regulations of the President.

(b) Certification. By submitting this offer, the Offeror, if a foreign person, company or entity, certifies that it--

(1) Does not comply with the Secondary Arab Boycott of Israel; and

(2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel by Arab countries, which 50 U.S.C. App. Sec. 2407(a) prohibits a United States person from taking.

(c) Representation of Extent of Transportation by Sea. (This representation does not apply to solicitations for the direct purchase of ocean transportation services).

(1) The Offeror shall indicate by checking the appropriate blank in paragraph (c)(2) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(2) Representation. The Offeror represents that it--

_____ Does anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

_____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(3) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense Federal Acquisition Regulation Supplement clause at 252.247-7024, Notification of Transportation of Supplies by Sea.

252.225-7006 BUY AMERICAN ACT - TRADE AGREEMENTS - BALANCE OF PAYMENTS PROGRAM CERTIFICATE (MAR 1998)

(a) Definitions. Caribbean Basin country end product, designated country end product, domestic end product NAFTA country end product, nondesignated country end product, qualifying country end product, and U.S. made end product have the meanings given in the Buy American Act--Trade Agreements--Balance of Payments Program clause of this solicitation.

(b) Evaluation.

Offers will be evaluated in accordance with the policies and of Part 225 of the Defense Federal Acquisition Regulation Supplement. Offers of foreign end products that are not U.S. made, qualifying country, designated country, Caribbean Basin country, or NAFTA country end products will not be considered for award, unless the Contracting Officer determines that there are no offers of such end products; or the offers of such end products are insufficient to fulfill the requirements; or a national interest exception to the Trade Agreements Act is granted.

(c) Certifications.

(1) The Offeror certifies that--

(i) Each end product, except the end products listed in paragraph (c)(2) of this provision, is a domestic end product; and

(ii) Components of unknown origin are considered to have been mined, produced, or manufactured outside the United States or a qualifying country.

(2) The Offeror must identify all end products that are not domestic end products.

(i) The Offeror certifies that the following supplies qualify as "U.S. made end products" but do not meet the definition of "domestic end product":

(insert line item number)

(ii) The Offeror certifies that the following supplies are qualifying country end products:

(insert line item number) (insert country of origin)

(iii) The Offeror certifies that the following supplies qualify as designated country end products:

(insert line item number) (insert country of origin)

(iv) The Offeror certifies that the following supplies qualify as Caribbean Basin country end products:

(insert line item number) (insert country of origin)

(v) The Offeror certifies that the following supplies qualify as NAFTA country end products:

(insert line item number) (insert country of origin)

(vi) The following supplies are other nondesignated country end products.

5352.215-9007 USE OF NON-GOVERNMENT ADVISORS (AFMC) (NOV 1998)

Name(s) of firm(s): Sverdrup Technology, Inc.

(1) Any objection to disclosure:

- (i) Shall be provided in writing to the contracting officer within 10 days of RFP issuance; and
- (ii) Shall include a detailed statement of the basis for the objection. The detailed statement shall identify the specific portions of the proposal the offeror objects to disclosure to non-Government advisors.

(2) I understand technical and cost/price data submitted to the Government in response to this solicitation may be released to non-Government advisors. I consent to release of any (unless objection is provided in (b)(1) above) proprietary, confidential, or privileged commercial or financial data provided by the firm(s) named below in response to this solicitation, to non-Government advisors for review and analysis:

Firm:

Name (individual authorized to commit firm):

Title:

Date of Execution:

An Ombudsman has been appointed to hear concerns from offerors or potential offerors during the proposal development phase of this acquisition. The Ombudsman does not diminish the authority of the program director or Contracting Officer, but communicates Contractor concerns, issues, disagreements, and recommendations to the appropriate Government personnel. When requested, the Ombudsman shall

maintain strict confidentiality as to the source of the concern. The Ombudsman does not participate in the evaluation of proposals or in the source selection process. Interested parties are invited to call Mr Alan Goldstayn at (931) 454-5613.

5352.209-9000 SPECIAL STANDARDS. (AFMC) (JUL 1997)

(a) Special standards of responsibility apply to this acquisition in accordance with FAR 9.104-2, Special Standards, paragraph (a). The following special standards apply:

The offeror must have successfully produced variable frequency starting systems of similar size and complexity.

(b) The offeror shall submit documentation with the proposal that demonstrates the offeror meets the above special standards. The Contracting Officer may request additional documentation after receipt of proposals. This documentation shall be used to determine whether or not an offeror meets the special standards of responsibility. Offerors failing to meet the special standards referenced in paragraph (a), above, shall be determined to be nonresponsible and, therefore, ineligible to receive contract award.

EVALUATION OF PROPOSALS

1. SOURCE SELECTION

1.1. Basis for Contract Award

The Government will select the best overall offer, based upon an integrated assessment of Mission Capability, Past Performance, Proposal Risk, and Price/Cost. This is a best value source selection conducted in accordance with Air Force Federal Acquisition Regulation Supplement (AFFARS) 5315.3 Source Selection and the AFMC supplement (AFMCFARS) thereto. A contract may be awarded to the offeror who is deemed responsible in accordance with the Federal Acquisition Regulation (FAR), as supplemented, whose proposal conforms to the solicitation's requirements (to include all stated terms, conditions, representations, certifications, and all other information required by the Instructions for Proposal Preparation of this solicitation) and is judged, based on the evaluation factors and subfactors to represent the best value to the Government. The Government seeks to award to the offeror who gives the Air Force the greatest confidence that it will best meet or exceed the requirements affordably. This may result in an award to a higher rated, higher priced offeror, where the decision is consistent with the evaluation factors and the Source Selection Authority (SSA) reasonably determines that the technical superiority and/or overall business approach and/or superior past performance of the higher price offeror outweighs the cost difference. To arrive at a source selection decision, the SSA will integrate the source selection team's evaluations of the evaluation factors and subfactors (described below). While the Government source selection evaluation team and the SSA will strive for maximum objectivity, the source selection process, by its nature, is subjective and, therefore, professional judgment is implicit throughout the entire process.

1.2. Number of Contracts to be Awarded

The Government intends to award one contract as a result of this solicitation.

1.3. Rejection of Unrealistic Offers

The Government may reject any proposal that is evaluated to be unrealistic in terms of program commitments, including contract terms and conditions, or unrealistically high or low in cost when compared to Government estimates, such that the proposal is deemed to reflect an inherent lack of competence or failure to comprehend the complexity and risks of the program.

1.4. Correction Potential of Proposals

The Government will consider, throughout the evaluation, the "correction potential" of any deficiency or proposal inadequacy. The judgement of such "correction potential" is within the sole discretion of the Government. If an aspect of an offeror's proposal not meeting the Government's requirements is not considered correctable, the offeror may be eliminated from the competitive range.

1.5. Discussions

If, during the evaluation period, it is determined to be in the best interest of the Government to hold discussions, offeror responses to Evaluation Notices (ENs), and the Final Proposal Revision (FPR) will be considered in making the source selection decision.

2 EVALUATION FACTORS

2.1. Evaluation Factors and Subfactors and their Relative Order of Importance

Award will be made to the offeror proposing the combination most advantageous to the Government based upon an integrated assessment of the evaluation factors and subfactors described below. The evaluation factors are equally important. Within the Mission Capability factor, the subfactors are listed in descending order of importance.

Factor 1: Mission Capability

Subfactor 1: System Performance

Subfactor 2: Schedule

Subfactor 3:: Participation of Small and Small Disadvantaged Businesses (SDB),Historically Black Colleges and Universities, and Minority Institutions

Factor 2: Past Performance

Factor 3: Proposal Risk

Factor 4: Price

2.2. Importance of Cost/Price

In accordance with FAR 15.304(e), the evaluation factors other than price, when combined, are significantly more important than price; however, price will contribute substantially to the selection decision.

2.3. Factor and Subfactor Rating

A color rating will be assigned to each subfactor under the Mission Capability factor. The color rating depicts how well the offeror's proposal meets the Mission Capability subfactor requirements in accordance with the stated explanation, within the subfactor, of how the subfactor will be evaluated. The Mission Capability subfactors are described in paragraph 2.4. below. A proposal risk rating will be assigned to each of the Mission Capability subfactors. Proposal risk represents the risks identified with an offeror's proposed approach as it relates to the Mission Capability subfactor. A Performance Confidence Assessment will be assigned to the Past Performance factor. Performance confidence represents the Government's assessment of the probability of an offeror successfully performing as proposed and is derived from an evaluation of the offeror's present and past work record. Price/cost will be evaluated as described in paragraph d below. When the integrated assessment of all aspects of the evaluation is accomplished, the color ratings, proposal risk ratings, performance confidence assessment, and evaluated cost/price will be considered in the order of priority listed in paragraph a above. Any of these considerations can influence the SSA's decision.

2.4. Mission Capability Factor

Each subfactor within the Mission Capability Factor will receive one of the color ratings described in AFFARS 5315.305(a)(3)(i), based on the assessed strengths and proposal inadequacies of each offeror's proposal as they relate to each of the Mission Capability subfactors. Subfactor ratings shall not be rolled up into an overall color rating for the Mission Capability factor.

2.4.1. System Performance: This subfactor will be evaluated on the basis of ability of the proposed system to comply with the minimum requirements of the system specification. Evaluation will consider the design review approach as well as system availability after commissioning.

2.4.2. Schedule/Downtime: This subfactor will be evaluated on both overall performance schedule as well facility downtimes. Each proposal will be evaluated on completeness and realism of planning for meeting any proposed schedule or downtime requirement. The extent of preparatory on-site effort and pre-downtime quality assurance verification of items to be installed will be evaluated in this subfactor.

2.4.3. Participation of Small and Small Disadvantaged Businesses (SDB), Historically Black Colleges and Universities, and Minority Institutions: All proposals will be evaluated as to the extent of participation of SDB firms. Offerors will provide targets for SDB participation, expressed as dollars and percentages of total contract value, in each of the applicable and authorized SIC Major Groups as well as a total target for SDB participation as joint venture partners, team members, or subcontractors. The authorized Standard Industrial Classification (SIC) Major Groups are 10, 12 - 17, 22 - 31 34, 36 - 39, 41, 42, 44, 46 - 65, 67, 70, 73, 75, 76, 80, 82, 87, and 89. These targets will be incorporated into and become a part of the contract. The successful offeror will be required to provide reports on SDB subcontractor participation in accordance with FAR clause 52.219-25 in Section I of the contract.

If the offeror is other than a small business, the offeror's Small Business Subcontracting Plan submitted in accordance with FAR 52.219-9 and Section L paragraph shall also be evaluated to determine the extent to which the offeror identifies and commits to the participation of SB, HBCU, and MI whether as joint venture members, teaming arrangement, or subcontractor. Failure to submit such a plan will render the offeror ineligible for award.

2.5. Past Performance Factor

Under the Past Performance factor, the Performance Confidence Assessment represents the evaluation of an offeror's present and past work record to assess the Government's confidence in the offeror's probability of successfully performing as proposed. The Government will evaluate the offeror's demonstrated record of contract compliance in supplying products and services that meet user's needs, including cost and schedule. The Past Performance Evaluation is accomplished by reviewing aspects

of an offeror's relevant present and recent past performance, focusing on and targeting performance which is relevant to the Mission Capability subfactors. In determining relevance, consideration will be given to turnkey, variable speed starting systems using the proposed technology for large motor systems of similar complexity and turnkey installations within downtime constraints. This information may include data on efforts performed by other divisions, critical subcontractors, or teaming contractors, if such resources will be brought to bear or significantly influence the performance of the proposed effort. Past efforts which used the proposed subcontractors or teaming for design, fabrication and/or installation will be considered more relevant. The Government may consider as relevant efforts performed for agencies of the federal, state, or local governments and commercial customers.

Where relevant performance record indicates performance problems, the Government will consider the number and severity of the problems and the appropriateness and effectiveness of any corrective actions taken (not just planned or promised). The Government may review more recent contracts or performance evaluations to ensure corrective actions have been implemented and to evaluate their effectiveness.

Each offeror will receive one of the ratings described in AFFARS 5315.305(a)(2)(S-92) for the Past Performance factor.

Offerors without a record of relevant past performance or for whom information on past performance is not available will not be evaluated favorably or unfavorably on past performance and, as a result, will receive a "Neutral/Unknown Confidence" rating for the Past Performance factor. More recent and relevant performance will have a greater impact on the Performance Confidence Assessment than less recent or relevant effort. A strong record of relevant past performance may be considered more advantageous to the Government than a "Neutral/Unknown Confidence" rating. Likewise, a more relevant past performance record may receive a higher confidence rating and be considered more favorably than a less relevant record of favorable performance.

2.6. Proposal Risk Factor

Proposal Risk will be evaluated at the Mission Capability subfactor level. The Proposal Risk assessment focuses on the risks and weaknesses associated with an offeror's proposed approach and includes an assessment of the potential for disruption of schedule, increased cost, degradation of performance, and the need for increased Government oversight, as well as the likelihood of unsuccessful contract performance. For each identified risk, the assessment also addresses the offeror's proposal for mitigating the risk and why that approach is or is not manageable. Each Mission Capability subfactor will receive one of the Proposal Risk ratings defined at AFFARS 5315.305(a)(3)(ii).

2.7. Price Factor

The offeror's cost/price proposal will be evaluated for award purposes, based upon the total price proposed for basic requirements (basic award) and all options.

Evaluation of options shall not obligate the Government to exercise such options.

3. PRE-AWARD SURVEY

The Government may conduct a pre-award survey (PAS) as part of this source selection. Results of the PAS (if conducted) will be evaluated to determine each offeror's capability to meet the requirements of the solicitation.

4. PLANT VISITS

The Source Selection Evaluation Team (SSET) may conduct plant visits during the evaluation phase to gather information for judging the offeror's potential for correcting deficiencies, quality of development or manufacturing practices/processes, or other areas useful in evaluating the offer. If conducted, the results will be assessed under the applicable factors/subfactors and will be used to validate and confirm the offeror's written proposal and/or oral presentation.

5. SOLICITATION REQUIREMENTS, TERMS AND CONDITIONS

Offerors are required to meet all solicitation requirements, such as terms and conditions, representations and certifications, and technical requirements, in addition to those identified as factors, and subfactors to be eligible for award. Failure to comply with the terms and conditions of the solicitation may result in the offeror being removed from consideration for award. Any exceptions to the solicitation's terms and conditions must be fully explained and justified.

INSTRUCTIONS FOR PROPOSAL PREPARATION

1.0 Program Structure and Objectives

1.1. Budget/Funding Information

For consideration in developing your proposal, funding for this project is expected in three increments. These funding increments are expected in FY01, FY02 and FY03 but could be delayed for an additional year. Providing a contract line item structure which allows at least three separate increments is considered a critical proposal requirement. Non-conformance with a three year funding profile may result in an unfavorable proposal evaluation.

2.0 General Instructions

(a) This section provides general guidance for preparing proposals as well as specific instructions on the format and content of the proposal. The offeror's proposal must include all data and information requested and must be submitted in accordance with these instructions. The offer shall be compliant with the requirements as stated in the System Specification and Model Contract. **Non-conformance with these instructions may result in an unfavorable proposal evaluation.**

(b) The proposal shall be clear, concise, and shall include sufficient detail for effective evaluation and for substantiating the validity of stated claims. The proposal should not simply rephrase or restate the Government's requirements, but rather shall provide convincing rationale to address how the offeror intends to meet these requirements. Offerors shall assume that the Government has no prior knowledge of their facilities and experience, and will base its evaluation on the information presented in the offeror's proposal.

(c) Elaborate brochures or documentation, binding, detailed art work, or other embellishments are unnecessary and are not desired. Similarly, for oral presentations, elaborate productions are unnecessary and not desired.

(d) The proposal acceptance period is specified in the model contract/solicitation. The offeror shall make a clear statement in the proposal documentation volume that the proposal is valid until this date.

(e) In accordance with FAR Subpart 4.8 (Government Contract Files), the Government will retain one copy of all unsuccessful proposals. Unless the offeror requests otherwise, the Government will destroy extra copies of such unsuccessful proposals.

2.1 General Information

2.1.1. Point of Contact

The Contracting Officer (CO) is the **sole** point of contact for this acquisition. Address any questions or concerns you may have to the CO. Written requests for clarification may be sent to the CO at the address located in Section A of the model contract/ solicitation.

2.1.2. Debriefings

The CO will promptly notify offerors of any decision to exclude them from the competitive range, whereupon they may request and receive a debriefing in accordance with FAR 15.505. The CO will notify unsuccessful offerors in the competitive range of the source selection decision in accordance with FAR 15.506. Upon such notification, unsuccessful offerors may request and receive a debriefing. Offerors desiring debriefing must make their request in accordance with the requirements of FAR 15.505 or 15.506, as applicable.

2.1.3. Discrepancies

If an offeror believes that the requirements in these instructions contain an error, omission, or are otherwise unsound, the offeror shall immediately notify the CO in writing with supporting rationale. The offeror is reminded that the Government reserves the right to award this effort based on the initial proposal, as received, without discussion.

2.2 Organization/Number of Copies/Page Limits

The offeror shall prepare the proposal as set forth in the Proposal Organization Table (Table 2.2 below). The titles and contents of the volumes shall be as defined in this table, all of which shall be within the required page limits and with the number of copies as specified in Table 2.2. The attachments identified in the table should be separately bound in three-ring, loose-leaf binders, as necessary. The contents of each proposal volume are described in the ITO paragraph as noted in the table below:

Table 2.2 - Proposal Organization

VOLUME	Proposal Preparation Instructions Paragraph Number	VOLUME TITLE	PAGE LIMIT
I	3.0	Mission Capability	100
II	4.0	Contract Documentation	N/A
III	5.0	Relevant Past and Present Performance	2 Pages per Contract

Five hard copies of Volume I and two hard copies of Volumes II and III are required. One electronic copy of each volume is required.

2.2.1 Page Limitations

Page limitations shall be treated as maximums. If exceeded, the excess pages will not be read or considered in the evaluation of the proposal and (for paper copies) will be returned to the offeror as soon as practicable. Page limitations shall be placed on responses to ENs. The specified page limits for EN responses will be identified in the letters forwarding the ENs to the offerors. When both sides of a sheet display printed material, it shall be counted as 2 pages. Each page shall be counted except the following:

Cover pages, tables of contents, tabs, and glossaries

2.2.2 Pricing Information

All pricing information shall be addressed in the Contract Documentation volume, in Section B of the Schedule of the RFP. Information shall be limited to Contract Line Item Number (CLIN), or SubCLIN, level pricing, including unit and extended pricing, as specified in the Schedule of Items of the RFP.

2.2.3 Indexing

Each volume shall contain a more detailed table of contents to delineate the subparagraphs within that volume. Tab indexing shall be used to identify sections.

2.2.4 Glossary of Abbreviations and Acronyms

Each volume shall contain a glossary of all abbreviations and acronyms used, with an explanation for each. Glossaries do not count against the page limitations for their respective volumes.

2.3. Page Size and Format

(a) Page size shall be 8.5 x 11 inches, not including foldouts. Pages shall be single spaced. Except for the reproduced sections of the solicitation document, the text size shall be no less than 10 point. Use at least 1 inch margins on the top and bottom and 3/4 inch side margins. Pages shall be numbered sequentially by volume. These page format restrictions shall apply to responses to Evaluation Notices (ENs). These limitations shall apply to both electronic and hard copy proposals.

(b) Legible tables, charts, graphs and figures shall be used wherever practical to depict organizations, systems and layout, implementation schedules, plans, etc. These displays shall be uncomplicated, legible and shall not exceed 11 by 17 inches in size. Foldout pages shall fold entirely within the volume, and each 8.5 x 11 surface of a foldout shall be counted as a separate page. Foldout pages may only be used for large tables, charts, graphs, diagrams and schematics; not for pages of text. For tables, charts, graphs and figures, the text shall be no smaller than 10 point. These limitations shall apply to both electronic and hard copy proposals.

2.4 Binding and Labeling

Each volume of the proposal should be separately bound in a three-ring loose leaf binder which shall permit the volume to lie flat when open. Staples shall not be used. A cover sheet should be bound in each book, clearly marked as to volume number, title, copy number, solicitation identification and the offeror's name. The same identifying data should be placed on the spine of each binder. e sure to apply all appropriate markings including those prescribed in accordance with FAR 52.215-1(e), Restriction on Disclosure and Use of Data, and 3.104-5, Disclosure, Protection, and Marking of Contractor Bid or Proposal Information and Source Selection Information.

2.5 Electronic Offers

For electronic copies, indicate on each diskette or CD ROM, the volume number and title. Use separate files to permit rapid location of all portions, including exhibits, annexes, and attachments, if any. The offeror shall submit volumes in electronic format, using IBM-compatible, virus-free 3.5 inch high density diskettes with the "read only" notch open or CD ROM. If files are compressed, the necessary decompression program must be included. The electronic copies of the proposal shall be submitted in a format readable by Microsoft (MS) Word 97, MS Excel 97, MS-Project 97, and MS-Power Point 97, as applicable.

2.6 Distribution

The "original" proposal shall be identified. Proposals shall be addressed to the Contracting Officer and mailed to the address in Block 9 of the Standard Form 1449

3.0 Volume I - Mission Capability Volume

3.1 General

The Mission Capability Volume should be specific and complete. Legibility, clarity and coherence are very important. Your responses will be evaluated against the Mission Capability subfactors defined in the Evaluation Factors for Award. Using the instructions provided below, provide as specifically as possible the actual methodology you would use for accomplishing/satisfying these subfactors. All the requirements specified in the solicitation are mandatory. By your proposal submission, you are representing that your firm will perform all the requirements specified in the solicitation. It is not necessary or desirable for you to tell us so in your proposal. Do not merely reiterate the objectives or reformulate the requirements specified in the solicitation.

3.2 Format and Specific Content

3.2.1 Narrative Summary

A concise narrative summary of the entire proposal, including significant risks, and a highlight of any key or unique features, excluding cost/price. The salient features should tie in with evaluation factors/subfactors. Any summary material

presented here shall not be considered as meeting the requirements for any portions of other volumes of the proposal.

3.2.2 Mission Capability and Proposal Risk

Mission Capability and Proposal Risk will be addressed in the Mission Capability volume. In this volume, address your proposed approach to meeting the requirements of each Mission Capability subfactor, as well as the risks in your proposed approach in terms of mission capability/performance, cost, and/or schedule.

Address Proposal Risk by identifying those aspects of the proposal you consider to involve cost and/or mission capability subfactor risk and classify each in accordance with AFFARS 5315.305(a)(3)(iii). Provide the rationale for each risk and its rating, including quantitative estimates of the impact on cost, schedule, and performance. Describe the impact of each identified risk in terms of its potential to interfere with or prevent the successful accomplishment of other contract requirements (for example: SOW or specification requirements), whether or not those requirements are identified as subfactors or elements. Suggest a realistic "work-around" or risk mitigator for identified risks that will eliminate or reduce risk to an acceptable level. Identify and classify any new risks introduced by such risk mitigation.

3.2.2.1 System Performance: The proposal shall include an availability analysis that includes documented mean-time-between failure and mean-time-to-repair data for each system component. Provide a concise, complete analysis that logically combines the component properties to arrive at the overall system availability. The proposal shall include the design review process that will be used to ensure that the delivered systems meet all performance requirements, addressing as a minimum a description of the design reviews and the timing of those reviews in relation to the system fabrication/installation.

3.2.2.2 Schedule/Downtime: The proposal shall include a detailed schedule, with milestones, for all field investigations, design, fabrication, manufacturing, logistics, personnel mobilization, installation, and checkout work necessary to complete the work under this specification. Submit the schedule information in a Gantt chart format. Include individual work elements for each activity.

Submit not less than a third-level work breakdown structure. Show start and end dates for each work element, as well as work sequence, time sequence, and other pertinent interrelationships between all work elements.

3.2.2.3 Participation of Small and Small Disadvantaged Businesses, Historically Black Colleges and Universities and Minority Institutions. Offerors must provide this information with the model contract discussed in paragraphs 4.3.3.1 and 4.3.3.2 below. All information submitted for this subfactor will not be included in the page limitation for the Mission Capability Volume

3.2.3 Volume Organization

The Mission Capability volume shall be organized according to the following general outline:

- (1) Table of Contents
- (2) List of Table and Drawings
- (3) Glossary
- (4) Subfactor One – System Performance
- (5) Subfactor Two – Schedule/Downtime
- (6) Risk Matrix

4.0 Volume II - Contract Documentation

4.1 Model Contract/Representations and Certifications

The purpose of this volume is to provide information to the Government for preparing the contract document and supporting file. The offeror's proposal shall include a signed copy of the Model Contract.

4.1.1 - Solicitation/Contract Form

The offeror must complete blocks 12, 17,23, and 24 and signature and date for blocks 30 a-c of the Standard Form 1449. Signature by the offeror on the SF 1449 constitutes an offer, which the Government may accept. The "original" copy should be clearly marked under separate cover and should be provided without any punched holes.

4.1.2 Supplies or Services and Costs/Prices

Completed pricing information in schedule of items of the model contract. The offeror shall insert the proposed Contract Line Item structure with prices for the basic award and each option proposed. Any price adjustments based on timing of exercise of any option must be clearly stated.

4.1.3 Deliveries or Performance

The offeror shall propose the delivery schedule by in the Deliveries or Performance section of the model contract. The proposal must clearly define overall performance schedule for each.

4.1.4 Representations, Certifications, and other Statements of Offerors

The offeror shall complete all representations, certifications, acknowledgments and statements in the solicitation.

4.2 Exceptions to Terms and Conditions

Exceptions taken to terms and conditions of the model contract, to any of its formal attachments, or to other parts of the solicitation shall be identified. Each exception shall be specifically related to each paragraph and/or specific part of

the solicitation to which the exception is taken. Provide rationale in support of the exception and fully explain its impact, if any, on the performance, schedule, cost, and specific requirements of the solicitation. This information shall be provided in the format and content of Table 6.2. Failure to comply with the terms and conditions of the solicitation may result in the offeror being removed from consideration for award.

Table 4.2 - Solicitation Exceptions

<i>SOLICITATION Document</i>	<i>Paragraph/Page</i>	<i>Requirement/Portion</i>	<i>Rationale</i>
<i>SPEC Model Contract, Instructions for Proposal Preparation, etc.</i>	<i>Applicable Page and Paragraph Numbers</i>	<i>Identify the requirement or portion to which exception is taken</i>	<i>Justify why the requirement will not be met</i>

4.3 Other Information Required

4.3.1 Authorized Offeror Personnel

Provide the name, title and telephone number of the company/division point of contact regarding decisions made with respect to your proposal and who can obligate your company contractually. Also, identify those individuals authorized to negotiate with the Government.

4.3.2 Company/Division Address, Identifying Codes, and Applicable Designations

Provide company/division's street address, county and facility code; CAGE code; DUNS code; size of business (large or small); and labor surplus area designation. This same information must be provided if the work for this contract will be performed at any other location(s). List all locations where work is to be performed and indicate whether such facility is a division, affiliate, or subcontractor, and the percentage of work to be performed at each location.

4.3.3 Attachments to the Model Contract

The offeror shall provide the following as attachments to the model contract:

4.3.3.1 Subcontracting Plan

Include a Subcontracting Plan in accordance with FAR 19.702. The plan must be approved by the CO before contract award.

4.3.3.2 Participation of Small Disadvantaged Businesses

Pursuant to the requirements of FAR provision 52.219-24, each offeror must provide, with its offer, targets, expressed as dollars and percentages of total

contract value, for SDB participation in any of the SIC Major Groups as determined by the Department of Commerce. The authorized SIC Major Groups are 10, 12 - 17, 22 - 31 34, 36 - 42, 44, 46 - 65, 67, 70, 73, 75, 76, 80, 82, 87, and 89. These SIC Major Groups are also posted at <http://www.arnet.gov/Reference/sdbadjustments.htm>. The targets may provide for participation by a prime contractor, joint venture partner, teaming arrangement member, or subcontractor; however, the targets for subcontractors must be listed separately.

4.3.3.3 Participation of Small Businesses (SB), Historically Black Colleges and Universities, or Minority Institutions (HBCU/MI)

If the offeror is other than a small business, the offeror shall submit a Small Business Subcontracting Plan in accordance with FAR 52.219-9 that also identifies and specifies the extent of offeror's commitment to the participation of small businesses (SB), historically black colleges or universities (HBCU) and minority institutions (MI), whether as joint venture members, teaming arrangement partners, or subcontractors. If applicable, submit a copy of your approved Master Plan. In the event the offeror has negotiated a comprehensive subcontracting plan pursuant to DFARS 219.702, the offeror must submit the information that identifies and specifies the extent of its commitment to the participation of SB, HBCU and MI.

5.0 Volume III - Relevant Past and Present Performance

5.1 General

Each offeror shall submit a past and present performance volume with its proposal, containing past performance information in accordance with the format contained in Attachment 2. This information is required on the offeror and all subcontractors, teaming partners, and/or joint venture partners proposed to perform 25 per cent of the proposed effort based on the total proposed price, or perform aspects of the effort the offeror considers critical to overall successful performance. Offerors are cautioned that the Government will use data provided by each offeror in this volume and data obtained from other sources in the evaluation of past and present performance.

The offeror shall submit, along with the information required in this paragraph, a consent letter, executed by each subcontractor, teaming partner, and/or joint venture partner, authorizing release of adverse past performance information to the offeror so the offeror can respond to such information. For each identified effort for a commercial customer, offeror shall also submit a client authorization letter, authorizing release to the Government of requested information on the offeror's performance.

5.2 Early Proposal Information

Each offeror is requested to submit the information shown in Attachment 2 for each relevant contract 15 days before the date set for receipt of proposals. Failure to submit early proposal information will not result in offeror disqualification.

5.3 Relevant Contracts

Submit information in accordance with Attachment 2: Past Performance Information on five recent contracts that you consider most relevant in demonstrating your ability to perform the proposed effort. Also include information on five recent contracts performed by each of your teaming partners and significant subcontractors that you consider most relevant in demonstrating their ability to perform the proposed effort. Include rationale supporting your assertion of relevance. For a description of the characteristics or aspects the Government will consider in determining relevance, see Evaluation Factors, paragraph 2.5 - Past Performance Factor. Note that the Government generally will not consider performance on a newly awarded contract without a performance history or on an effort that concluded more than ten years before this source selection.

5.3.1 Specific Content

Offerors are required to explain what aspects of the contracts are deemed relevant to the proposed effort, and to what aspects of the proposed effort they relate. This may include a discussion of efforts accomplished by the offeror to resolve problems encountered on prior contracts as well as past efforts to identify and manage program risk. Merely having problems does not automatically equate to a little or no confidence rating, since the problems encountered may have been on a more complex program, or an offeror may have subsequently demonstrated the ability to overcome the problems encountered. The offeror is required to clearly demonstrate management actions employed in overcoming problems and the effects of those actions, in terms of improvements achieved or problems rectified. This may allow the offeror to be considered a higher confidence candidate. For example, submittal of quality performance indicators or other management indicators that clearly support that an offeror has overcome past problems is required. Categorize the relevance information into the specific Mission Capability subfactors used to evaluate the proposal.

5.3.2 Organizational Structure Change History

Many companies have acquired, been acquired by, or otherwise merged with other companies, and/or reorganized their divisions, business groups, subsidiary companies, etc. In many cases, these changes have taken place during the time of performance of relevant present or past efforts or between conclusion of recent past efforts and this source selection. As a result, it is sometimes difficult to determine what past performance is relevant to this acquisition. To facilitate this relevancy determination, include in this proposal volume a "roadmap" describing all such changes in the organization of your company. As part of this explanation, show how these changes impact the relevance of any efforts you identify for past performance evaluation/ performance confidence assessment. Since the Government intends to consider present and past performance

information provided by other sources as well as that provided by the offeror(s), your "roadmap" should be both specifically applicable to the efforts you identify and general enough to apply to efforts on which the Government receives information from other sources.

GENERAL SPECIFICATION
FOR
REPLACEMENT OF THE VARIABLE FREQUENCY STARTING SYSTEMS
FOR THE
ENGINE TEST FACILITY
C-PLANT

ARNOLD ENGINEERING DEVELOPMENT CENTER
ARNOLD AIR FORCE BASE, TENNESSEE 37389-9998

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ATTACHMENTS

Attachment 15060.1	AEDC-ENG-STD-T2, Section 6 Certification Report
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DIVISION 1
GENERAL REQUIREMENTS

1. GENERAL

- 1.1 The Contractor shall provide two completely designed, furnished, and installed synchronous motor drive systems for the Engine Test Facility (ETF) C-Plant. The Contractor shall perform the solid-state drive system replacement as a "Turn-key" project, providing all materials, labor, and resources to engineer, design, procure, fabricate, inspect, test, deliver, install, commission, and document the two drive systems. The work includes the following:
- a. Project management including management plans, schedules, submittals, progress meetings, and progress reports.
 - b. Engineering and design including studies, calculations, analyses, drawings, specifications, and test plans.
 - c. Site construction including demolition of existing VFSS equipment and modifications to existing cooling water systems, electrical power and control systems, including interconnecting cabling.
 - d. Reconnection and testing of input and output power components from the input transformer through the output transformer and the Drive System start bus.
 - e. Installation of harmonic filter networks, if needed, including capacitors, inductors, switching devices, and tests.
 - f. Installation and connection of two new motor drive systems that shall interface with existing switchgear, buswork, cooling system, instrumentation and controls.
 - g. Spare parts from the removal of the first system shall be staged until the demolition of the second unit is started.
 - h. Drive system commissioning including component and subsystem testing, integrated no load tests, motor operational tests, and load tests.
 - i. Training required for maintenance, operations, and safety.
- 1.2 All components to be removed must be salvaged by the contractor subject to approval by the Contracting Officer (See 02070, 1.1.1.2-Demolition Plan). Any components not utilized by the new drive system shall be considered scrap and removed from AEDC by the contractor.
- 1.3 The contractor shall notify the Contracting Officer in writing prior to working with or on utility systems including, but not limited to electrical power, communication, instrumentation and controls, water, etc. Work clearances shall be obtained from the test support contractor prior to execution of work.

- 1.4 Verification of dimensions: The location dimensions and line configurations on the existing drawings may not reflect as-built conditions. The contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work. The contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.
- 1.5 Program reviews: The contractor shall conduct the following reviews (including preparation of agendas, presentations, and meeting minutes) at the times and locations specified below:

<u>Review</u>	<u>Time</u>	<u>Location</u>
Initial Program Review (IPR)	The initial program review shall be held about one month after effective date of the contract award (ACA)	AEDC
Preliminary Design Review (PDR)	Design to be 30 - 40% complete	Contractor's Facility
Critical Design Review (CDR)	Design to be 95% complete	AEDC
Preconstruction Conference (PCC)	Two weeks prior to start of on-site work	AEDC
Construction Conference	After on-site work initiates, weekly during non-downtime construction, twice-weekly during downtime construction.	AEDC

- 1.5.1 Pre-review action: The contractor shall prepare and distribute a review package (3-copies) for Contracting Officer approval two weeks prior to the meeting.
- 1.5.2 Review actions: The contractor shall conduct the reviews as described in para. 1.6.
- 1.5.3 Post-review action: The contractor shall publish and distribute 3-copies of review minutes within two weeks of the review. All action items from the PDR and CDR shall be closed to qualify the review as complete. The Contracting Officer shall approve completion of the PDR and CDR.

- 1.6 Description of reviews:

- 1.6.1 Initial Program Review (IPR): The IPR shall be an informal review held at AEDC to review the contractor's proposal and familiarize the contractor with the actual job site. The contractor shall provide a complete job schedule for review at this time.
- 1.6.2 Preliminary Design Review (PDR): The PDR shall be a formal technical review of the basic design approach. It shall be prior to the start of detailed design. The overall technical program risks associated with the unit shall be reviewed on a technical, cost, and schedule basis.
- 1.6.2.1 Items to be reviewed: The Contractor shall present the following for review by the Contracting Officer:
- a. Performance calculations.
 - b. Functional flow and schematic diagrams.
 - c. Equipment layout drawings and preliminary drawings, including any proprietary or restricted design/process/components and information.
 - d. System control integration.
 - e. Safety engineering considerations.
 - f. Preliminary lists of materials, parts, and processes.
 - g. Pertinent reliability/maintainability/availability data.
 - h. Standardization considerations.
 - i. Preliminary mechanical and packaging design of required control/monitoring panel.
 - j. Electrical one-line and three-line diagrams.
- 1.6.3 Critical Design Review: The CDR shall be conducted prior to fabrication/production release to insure that the detail design solutions, as reflected in the engineering drawings or other submittals satisfy requirements established by the specification. The overall technical program risks shall be reviewed.

The result of a successful CDR shall be the establishment of the design baseline for detailed fabrication/production planning, i.e., the contractor is permitted to use the detail design as presented at CDR for initial fabrication/production efforts.

1.6.3.1 Items to be reviewed: The contractor shall present the following for review by the Contracting Officer:

- a. Detail engineering drawings and schematic diagrams.
- b. Detailed design in the following areas:
 - 1. Mechanical design
 - 2. Electrical and mechanical interface compatibility
 - 3. Reliability/maintainability/availability
 - 4. System safety engineering
 - 5. Standardization
 - 6. Electrical design
- c. Interface control drawings
- d. Design analysis and test data
- e. Life cycle costs.

1.6.4 Preconstruction Conference (PCC): The PCC shall be a formal review held within two weeks of contractor mobilizing on-site. The contractor shall review the status of all equipment, updated job schedule, and any proposed changes. The Government will visually inspect equipment available at this time and conduct briefings on safety, security, and fire regulations. All sub-contractors shall be present for these briefings. All submittals shall be made prior to this conference.

1.7 Factory Site Visits: Contractor shall make provision for a Government representative to visit and inspect the drive equipment manufacturing facilities during construction, testing and checkout of the drive systems.

END OF SECTION

1. GENERAL

1.1 Government documents: The following documents shall be enforced to the extent referenced herein. These publications are referred to in text by the basic designation only.

1.1.1 Drawings:

1.1.1.1 AEDC drawings

- a. See Appendix A for reference drawings

1.2 Non-government documents:

1.2.1 Standards:

1.2.1.1 American National Standards Institute (ANSI):

- a. B31.3-96 Process Piping
- b. Y14.5M-94 Dimensions and Tolerances

1.2.1.2 American Welding Society (AWS):

- a. D1.1-96 Structural Welding Code - Steel

1.2.1.3 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS):

- a. SP-6-96 Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings
- b. SP-25-93 Marking System for Valves, Fittings, Flanges and Unions
- c. SP-58-93 Pipe Hangers and Supports-Material, Design and Manufacture
- d. SP-69-96 Pipe Hangers and Supports - Selection and Application

1.2.1.4 American Institute of Steel Construction (AISC):

- a. S335-89 Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design
- b. S329-85 Allowable Stress Design Specification for Structural Joints Using ASTM-A-325 or A-490 Bolts

1.2.1.5 Underwriters Laboratories (UL):

- a. UL 6-93 Rigid Metal Conduit, 1983
- b. 508-93 Industrial Control Equipment

1.2.1.6 Institute of Electrical and Electronic Engineers (IEEE):

- a. 142-1991 Grounding of Industrial and Commercial Power Systems
- b. 519-1992 Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- c. Std. 2 Electrical Nomenclature

1.2.1.7 National Electrical Manufacturers Association (NEMA):

- a. ICS 2-93 Standards for Industrial Control Devices, Controllers and Assemblies
- b. ICS 6-93 Enclosures for Industrial Controls and Systems

1.2.1.8 National Fire Protection Association (NFPA) Publication:

- a. 70-1999 National Electrical Code (NEC)

1.2.1.9 American Society of Mechanical Engineers (ASME)

- a. Section II Part C Boiler and Pressure Vessel Code

1.2.1.10 OSHA Safety Requirements

END OF SECTION

1. GENERAL

1.1 Description of requirements: This section specifies requirements for non-administrative submittals, including shop drawings, product data, and other miscellaneous work-related submittals. These submittals are required to amplify, expand, and coordinate other information contained in the contract. Non-work-related submittals are addressed elsewhere in the contract rather than in the specification and include items such as:

- a. Contract Progress Schedule
- b. Permits
- c. Payment Applications
- d. Performance and Payment Bonds
- e. Insurance Certificates
- f. Progress Reports

1.1.1 Shop drawings: These are technical drawings and data specially prepared for this project and include the following items:

- a. Fabrication and installation drawings
- b. Coordination drawings (for use on-site)
- c. Inspection and test reports (refer to paragraph 1.3.3)
- d. System schematics

1.1.2 Product data: This data includes standard product literature such as:

- a. Manufacturer's product specifications and installation instructions
- b. Standard color charts
- c. Catalog cuts
- d. Manufacturer's recommended spare parts list.

1.1.3 Miscellaneous submittals: These are required submittals that do not fit in the two previous categories, such as:

- a. Record drawings (as-built drawings)
- b. Qualification certificates
- c. System Operations and maintenance manuals
- d. Performance validation test plan
- e. Detailed Troubleshooting Guide (in the English Language)

1.2 Submittal procedures:

1.2.1 Coordination: Coordinate the preparation and processing of submittals with the contracting officer. Process each submittal with other submittals and related activities, such as testing, purchasing, fabrication, and delivery that require sequential activity.

1.2.2 Listing: Refer to Table 01340.1 for a summarized listing of required submittals. Refer to reference paragraph numbers listed for further description of submittals.

1.2.3 Transmittal timing: Submittals shall be tendered in accordance with Table 01340.1.

1.2.3.1 Transmittal times are indicated in Table 01340.1 by indicating the number of calendar days prior to or after the appropriate milestone. For example "CDR-45" states that the submittal shall be submitted 45 days prior to the critical design review (CDR). Milestone acronyms are as below:

- | | | |
|----|-----|---------------------------------|
| a. | TOO | Time of Occurrence |
| b. | PDR | Preliminary Design Review |
| c. | CDR | Critical Design Review |
| d. | PCC | Preconstruction Conference |
| e. | IOC | Initial Operational Capability. |

1.2.4 Review time: The Government will review the submittals and notify the contractor of acceptability or deficiencies within thirty days after receipt. The contractor shall submit corrections of disapproved data within twenty-one days of receipt of Notice of Disapproval. No extension of time will be authorized because of the contractor's failure to transmit submittals to the Government sufficiently in advance of the work.

1.2.5 "Approval" submittals: Submittals requiring approval by the Contracting Officer are so designated in the applicable sections of Table 01340.1. Approval by the Contracting Officer does not indicate any Government acceptance or responsibility for the proper operation or performance of the unit. When brand names or equal are specified, any "equal" submitted will require approval. Any submittal requesting a deviation will require approval.

1.2.6 "Information only" submittals: Submittals requested for information purposes only. These do not require Contracting Officer approval but are required to be submitted as specified.

1.3 Specific submittal requirements: Except as otherwise indicated in the individual sections, comply with the requirements specified herein for each type of submittal.

1.3.1 Shop drawings and system schematics:

- a. The contractor shall be responsible for making the detailed shop drawings and system schematics. All contractor drawings shall be electronically generated. All drawings shall be prepared per American National Standards Institute Y-Designation Standards.
- b. The contractor's drawings shall show detail dimensions and material specifications (Bill of Material) lists, which shall include manufacturer and model number of commercially purchased items.
- c. Drawings submitted for the formal reviews shall be half-size [14 inches (vertical) x 22 inches (horizontal)] and in accordance to Table 01340.1.
- d. Final drawings shall be submitted as follows: one reproducible copy [22 inches (vertical) x 34 inches (horizontal)], 3 half-size copies [14 inches (vertical) x 22 inches (horizontal)], and an electronic file copy of all drawings on compact disk, submitted to the Government in AutoCAD Release 14.
- e. Drawings shall be certified by a licensed, professional engineer, indicating state and license number.

1.3.2 Product data: General information required specifically as product data includes manufacturer's standard printed recommendations for operation and maintenance, compliance with recognized standards of trade associations and testing agencies, the application of their labels, and special coordination requirements for interfacing the material, product, or system with other work.

1.3.3 Inspection and test reports: Submit inspection and test reports in contractors standard format.

1.3.4 Record data (as-built) drawings: Provide record (as-built) drawings of all the actual installed systems using field measurements. These drawings shall be production drawings, not marked up shop drawings. They shall be formatted as specified in para. 1.3.1.d of this section.

1.3.5 Operations and maintenance data: Provide three bound copies of all operating data and maintenance manuals and a copy on electronic media if commercially available.

1.3.6 System schematics: System schematics shall be developed for all electrical and piping systems. System schematics shall include all system components. Schematics shall contain a device list showing the following information for each component: (Electrical nomenclature shall comply with IEEE Std. C-2)

- a. Device number

- b. Type of device
- c. Size or rating

- 1.4 Required submittals: A listing of all the required submittals is shown in the following table. All submittals shall have a cover sheet containing the contract number, submittal number, submittal description, actual submittal date and required submittal date.

1Section	Reference	Submittal Description	Appr.	Info.	Submission Timing	No. of Copies Required
02070	Para. 1.1.1.2	Demolition Plan	X		PCC-75	4
	Para. 1.3	Demolition Schedule and Sequence of Operation	X		PCC-45	4
	Para. 3.2	Report of Conflicts		X	TOO + 7	4
03732	Para. 1.3.1	Product Data		X	PCC-30	4
	Para. 1.3.2	Drawings	X		CDR-30	4
	Para. 1.3.3	As-Built Drawings	X		IOC + 30	4
05120	Para. 1.3.1	Drawings	X		CDR-45	4
	Para. 1.3.2	Welder Qualifications and Procedures	X		TOO-14	2
	Para 1.3.3	As-Built Drawings	X		IOC + 30	4
9900	Para. 1.6	Contractor's Paint Procedure	X		CDR-45	3
15060	Para. 1.5.1	Welder Qualifications and Procedures	X		TOO-14	2
	Para. 1.5.2	Piping Product Data		X	CDR-45	2
	Para. 1.5.3	As-Built Drawings	X		IOC+30	4
	Para. 1.5.4	Certification Report		X	TOO+14	2
	Para. 2.4.2	Gasket Product Data		X	CDR-45	2
15140	Para. 1.4	Support and Anchor Design Calculations	X		CDR-45	2

TABLE 01340.1: Required submittal list

2Section	Reference	Submittal Description	Appr.	Info.	Submission Timing	No. of Copies Required
Attachment 16480.1	Para. 3.2.3.2.1	Component Maintainability List	X		CDR - 45	2
	Para. 3.2.3.2.1	Spare Parts Ordering Procedures		X	CDR - 30	3
	Para. 3.2.3.2.2	Maintenance Manuals	X		IOC - 45	4
	Para. 3.2.3.2.3	Descriptive Literature and Diagrams	X		IOC - 45	3
	Para. 3.2.3.2.4	Shop Drawings and System Schematics	X		CDR - 45	4
	Para. 3.3.3.1	Short Circuit Study	X		CDR-60	3
	Para. 3.3.3.2	Certified Relay Trip Curves for Medium Voltage Equipment	X		CDR - 45	3
	Para. 3.3.3.3	Harmonic Data		X	TOO + 14	2
	Para 3.3.3.5	Motor and Compressor System Analysis	X		CDR - 45	2
	Para. 3.4.1	Design Drawings	X		CDR - 45	2

TABLE 01340.1: Required submittal list – continued

3Section	Reference	Submittal Description	Appr.	Info.	Submission Timing	No. of Copies Required
Attachment 16480.1	Para. 3.6.2	Site Installation Plan	X		CDR - 45	2
	Para 4.2	Certified Factory Inspection Reports		X	TOO + 21	2
	Para. 4.3.3	Commissioning Plan	X		PCC - 45	4
	Para. 4.3.4	Certified Subsystem Inspection Report		X	TOO + 21	2
	Para. 5	Training Plan	X		TOO - 45	3
16130	Para. 1.2.1	Descriptive Literature for Wiring Boxes	X		CDR - 45	3
	Para. 1.2.2	Descriptive Literature for Pull Boxes	X		CDR - 45	3
	Para. 1.2.3	Descriptive Literature for Junction/Control Boxes	X		CDR - 45	3
16050	Para. 1.2.1	Electrical Installation drawings	X		CDR – 45	3
	Para. 1.2.2	Electrical record (as-built) drawings		X	IOC + 30	3
	Para. 1.2.3	Welding certification	X		PCC – 45	2

TABLE 01340.1: Required submittal list – complete

DIVISION 2

SITEWORK

GENERAL

- 1.1 Summary: This section applies to demolition of selected items as deemed necessary by the contractor to meet the requirements of this specification and subsequent removal of resulting debris. All hardware to be demolished shall remain the property of the Government.

1.1.1 DEMOLITION OF EXISTING VFSS

- 1.1.1.1 General: The Contractor shall demolish or salvage all existing VFSS equipment which is to be replaced/abandoned including all associated materials not required to install the new drive system.
- 1.1.1.2 Demolition Plan: The Contractor shall submit a Demolition Plan, for Approval by the Contracting Officer, 75 calendar days prior to the start of demolition work. The Demolition Plan shall identify the Contractor's demolition scope and methods, and include the following details:
- a. A complete list of the equipment, materials to be demolished, trade-in, modified, salvaged, scrapped or temporarily relocated. The Demolition Plan shall include Government identified salvaged items.
 - b. Drawings and/or descriptions of the cranes, cribbing assemblies, and rigging assemblies proposed for the demolition work.
 - c. A demolition procedure describing the step-by-step approach for the demolition and removal of each major component or sub-system. Include details for duct and noise control protection.
 - d. A demolition schedule identifying the planned demolition start date, duration, and interfaces of each major component or sub-system to be demolished.
 - e. Methods used to remove from site and dispose of demolished equipment.
 - f. Methods to protect existing equipment adjacent to or near the demolition area.

The Contractor shall not begin any demolition work until the Contracting Officer has approved the Demolition Plan.

- 1.1.1.3 Required Equipment to be Demolished: The Contractor shall demolish all existing VFSS equipment that is replaced or abandoned as required to install the new drive system. The Contractor shall determine the equipment and related systems

required to be demolished based on the Contractor's new drive system design and equipment layout. The Contractor may configure the new drive system to minimize the required demolition work, but as a minimum, the following existing VFSS equipment shall be demolished.

- a. Rectifier
- b. Inverter
- c. Dc link
- d. Controls cubicles
- e. Cooling cubicle and associated piping

1.1.1.4 Optional Equipment to be Demolished: The Contractor may elect to demolish existing equipment in addition to that required in Section 1.1.1.3 to accommodate the Contractor's drive system equipment geometry, layout, or other physical constraints. The demolition of any equipment in addition to that specified in Section 1.1.1.3 does not represent a change in the Contract scope, and shall be completed at no additional cost to the Government. Additional equipment which may be demolished by the Contractor includes, but is not limited to, the following items.

- a. RC Network
- b. Switchgear
- c. Busses and bus ducts

The Contractor shall identify any equipment or materials to be demolished in addition to those in Section 1.1.1.3 in the Contractor's Demolition Plan.

1.1.1.5 Disposition of Demolished Equipment and Materials: Equipment and materials to be demolished shall be listed by the Contractor in his Demolition Plan (see 1.1.1.2a) and designated as either Equipment for Trade-in, Salvage, or Scrap. Items designated as Equipment for Trade-in may be used to offer the Government a credit allowance towards the purchase of the new drive system (see section 01010 para. 1.2). Items that are not accepted for trade-in and not classified as scrap shall be designated as equipment to be salvaged and shall remain the property of the Government. All salvageable material and equipment shall be removed to a Government provided salvage yard.

Title to all materials and equipment designated as Scrap is vested to the Contractor upon the date which demolition starts. The Contractor shall obtain a Scrap Pass from the Contracting Officer for each truckload of scrap to be removed from the site. Scrap materials shall be removed from Government property on a daily basis unless otherwise directed by the Contracting Officer. All

scrap materials shall be removed from Government property prior to the completion of the contract work. Scrap shall not be sold on the site. All materials shall be disposed of in accordance with applicable industrial regulations, and local, state, and federal regulations.

Salvageable and trade-in components for the first VFSS to be replaced shall remain the property of the government until demolition of the second unit has begun.

- 1.1.1.6 Electrical Interfaces: All electrical cables and wiring shall be removed back to the first facility junction box terminal that will not be removed as part of the demolition. Any wiring removed shall be tagged with a label as to the junction box and terminal number from which it was removed. Wiring shall be wrapped and protected from damage during any relocation.
 - 1.1.1.7 Mechanical Interfaces: Mechanical hardware shall be disconnected at the nearest convenient connection to existing services that are to remain. Piping shall be disconnected and capped where it enters the room.
 - 1.2 Although the VFSS and/or related equipment is expected to be asbestos free, contact the Contracting Officer upon encountering any material containing or suspected of containing asbestos. Do not remove the material until the Contracting Officer approves a removal plan and arrangements shall be made to the work schedule as necessary to continue overall job progress without delay.
 - 1.3 Submit a schedule indicating proposed methods and sequence of operations for selective demolition work to the Contracting Officer for review prior to commencement of work. Include coordination for shut-off and continuation of utility services. Include a list of items designated for demolition.
 - 1.4 Provide temporary barricades and other forms of protection required to protect personnel from injury due to selective demolition work. Remove protections at completion of work.
 - 1.5 Notify the Government of damages caused to adjacent facilities by demolition work. The contractor shall repair these damages at no cost to the Government.
 - 1.6 Do not interrupt existing utilities except when authorized in writing by the Contracting Officer.
 - 1.7 Transportation of salvaged materials to an area at AEDC designated by the Contracting Officer shall be the contractor's responsibility.
2. PRODUCTS - Not applicable

3. EXECUTION

- 3.1 Prior to commencement of selective demolition work, inspect areas in which work will be performed. Upon request, the Government will photograph existing conditions of structure surfaces, equipment or surrounding properties that could be misconstrued as damage resulting from selective demolition work.
- 3.2 If unanticipated elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of conflict. Submit report to Contracting Officer in written, accurate detail. Pending receipt of directive from Contracting Officer rearrange selective demolition schedule as necessary to continue overall job progress without delay.
- 3.3 Remove debris, rubbish/waste and other materials resulting from demolition operations from building site. Dispose of all waste in an AEDC landfill per Contracting Officer's instructions. Coordinate times of delivery with the Government representative (normally from 7:00 am to 1:00 p.m., Monday through Friday).
- 3.4 Burning of removed materials is not permitted on site.
- 3.5 Repair any excess damage occurred during performance of selective demolition. As a minimum, return remaining equipment, structures and surfaces to their condition existing prior to the start of selective demolition work.
 - 3.5.1 Repair concrete in accordance with Section 03732.

END OF SECTION

DIVISION 3

CONCRETE

1. GENERAL

- 1.1 Summary: Repair or replace existing equipment bases as needed.
- 1.2 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents.
 - 1.2.1 American Society for Testing Materials (ASTM):
 - C476-95 Standard Specification for Grout and Masonry.
- 1.3 Submittals:
 - 1.3.1 Submit product data indicating product standards, physical and chemical characteristics, technical specifications, limitations and general recommendations regarding each material.
 - 1.3.2 Submit drawings and stress analysis to substantiate adequacy of item 1.1.
 - 1.3.3 Accurately record actual locations of repairs and type of repair made on standard shop drawing format. Submit with "as-built" drawings.
- 1.4 Concrete and metal surfaces in contact with grout shall be clean and free of oil or grease.

2. PRODUCTS

- 2.1 Materials:
 - 2.1.1 Grout: Per ASTM-C-476-95.
 - 2.1.2 Concrete: 3000 pounds-per-square-inch (psi) compressive strength.

3. EXECUTION:

- 3.1 Surfaces shall be clean and dry.
- 3.2 Do not pour concrete into water or onto debris.
- 3.3 Finish of the bases shall match that of the surrounding floor.
- 3.4 All structural, expansion, or stress relief joints shall be finished to match existing surfaces.

- 3.5 Repair exposed structural, shrinkage, and settlement cracks of concrete.

END OF SECTION

DIVISION 4

NOT USED

DIVISION 5

METALS

1. GENERAL

- 1.1 Provide all structural steel members, base plates, and bolting required to adequately support the unit and all accessories as described herein.
- 1.2 The AISC S335-89 Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design shall govern the work. Welding shall be in accordance with AWS Code D1.1. High-strength bolting shall be in accordance with the AISC S329-85, Allowable Stress Design Specification for Structural Joints Using ASTM-A-325 or A-490 Bolts.
- 1.3 Submittals:
 - 1.3.1 Submit shop drawings, including welds and bolting, of any shop and erection details to the Contracting Officer for approval.
 - 1.3.2 Welders, welding operators, and welding procedures for all structural steel shall be qualified in accordance with AWS D1.1. The contractor shall submit to the Contracting Officer a certified report of the records of qualification test of each welder, welder operator and weld procedure.
 - 1.3.3 Provide as-built drawings to the Contracting Officer showing details and location of structure relative to structural framework column lines. Drawings shall identify all items and material used. Drawings shall be in accordance with Section 01340, para. 1.3.1.
- 1.4 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents.
 - 1.4.1 American Society of Testing Materials (ASTM) Standards:
 - a. A325-96 Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength
 - b. A36/A36M-96 Carbon Structural Steel
 - c. A307-94 Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - d. A490-93 Heat-Treated Steel Structural Bolts, 150,000 psi Minimum Tensile Strength
 - e. A-563-94 Carbon and Alloy Steel Nuts

- f. A194-96 Carbon and Alloy Steel Nuts for Bolts for
 high-pressure and High-Temperature Service
- g. F436-93 Hardened Steel Washers

2. PRODUCTS

- 2.1 Structural steel: Structural steel shall conform to ASTM-A-36.
- 2.2 High-strength bolts: High-strength bolts shall conform to ASTM-A-325, Type 1.
- 2.3 High-strength nuts: High strength nuts shall conform to ASTM-A-194, Grade 2H.
- 2.4 Carbon steel bolts: Carbon steel bolts shall conform to ASTM-A-307, Grade A.
 Use of these bolts shall be restricted to anchor bolts.
- 2.5 Carbon steel nuts: Carbon steel nuts shall conform to ASTM-A-563, Grade A, hex
 style. Use of these nuts shall be restricted to anchor bolts.
- 2.6 Plain washers: Plain washers shall conform to ASTM-F-436, Type 1, circular
 style.

3. EXECUTION

- 3.1 Fabrication: Fabrication shall be in accordance with AISC S335-89. Fabrication
 and assembly shall be done in the shop to the greatest extent possible.
- 3.2 Erection: Erection of structural steel shall be in accordance with AISC S335-89.
 - 3.2.1 Connections: Anchor bolts and other connections between the structural
 steel and foundations shall be properly located and built into connecting
 work.
 - 3.2.2 Field welded connections: Field welded structural connections shall be
 completed before load is applied.

END OF SECTION

DIVISIONS 6 - 8

NOT USED

DIVISION 9

FINISHES

1. GENERAL

- 1.1 Paint all carbon steel surfaces and structural steel installed or disturbed as part of this contract.
- 1.2 Do not paint galvanized conduit, rotating components, stainless steel, copper, seating surfaces, nameplates, plastic equipment, or insulation jacketing.
- 1.3 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents:
 - 1.3.1 Federal standard:
 - a. FED-STD-595B Acrylic gloss No. 16405
 - 1.3.2 Steel Structures Painting Council (SSPC):
 - a. SP6-94 Surface Preparation Specification No. 6, Commercial Blast Cleaning
 - b. SP10-94 Surface Preparation Specification No. 10, Near-White Blast Cleaning
- 1.4 Protect adjacent surfaces from spills and mishaps. Clean spills or mishaps to original condition.
- 1.5 Like equipment shall have the same finish coat color.
- 1.6 In lieu of this painting specification, the Contractor may submit his standard painting procedure to the Contracting Officer for approval.

2. PRODUCTS

- 2.1 Uninsulated carbon steel:
 - 2.1.1 Primer Coat: Recoatable primer epoxy series B67H5/B67V5 by Sherwin-Williams or equal.
 - 2.1.2 Finish coat: Per manufacture's standard color.

3. EXECUTION:

- 3.1 Uninsulated carbon steel pipe and vessels:
 - 3.1.1 Surface preparation: Commercial blast to SSPC - SP6 standards.

3.1.2 Primer coat: Apply one full coat recoatable primer epoxy 4.0 mils thick by brush or spray.

3.1.3 Finish coat: Apply two full coats of 2.1.2.b at 3.0 mils per coat by brush or spray.

3.3 Structural Steel:

3.3.1 Surface preparation: Commercial blast to SSPC - SP6 standards.

3.3.2 Primer coat: Apply one full coat recoatable primer epoxy 4.0 mils thick by brush or spray.

3.3.3 Finish coat: Apply two full coats of 2.1.2.a at 3.0 mils per coat by brush or spray.

3.4 Spray painting shall not be performed on AEDC property.

3.5 Do not sand blast inside the building. A designated area will be provided for sand blasting upon request.

3.6 Identify all piping in accordance with Attachment 15060.2.

3.7 Clean up and dispose of any sand used for on-base sandblasting.

END OF SECTION

DIVISIONS 10 - 14

NOT USED

DIVISION 15
MECHANICAL

1. GENERAL

- 1.1 This section covers the design and installation of all new or replacement piping.
- 1.2 Verification of dimensions: The contractor shall visit the premises to thoroughly familiarize himself with all details of the work and working conditions and verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work. The contractor shall be specifically responsible for the coordination and proper relation of his work to the building structure and to the work of all trades.
- 1.3 Design of piping: The contractor shall connect to the current interfaces of the Variable Frequency Starting System, unless the current interfaces are not located such that they may be used. If these interfaces are not usable as they now exist then the contractor may redesign/relocate the existing interfaces. The contractor shall be responsible for the design and analysis of the piping and its supports, which must be in accordance with ANSI B31.3 and these specifications.
- 1.4 Quality assurance: The contractor supplied piping shall be designed such that sections are removable for equipment access and provisions are to be made to close the existing system so that other units may operate while construction is in progress.
 - 1.4.1 Welding: Qualify welding procedures, welders, and operators in accordance with ANSI B31.3.
- 1.5 Submittals:
 - 1.5.1 Welder qualifications: The contractor shall submit to the Contracting Officer a certified report of the records of qualification test of each welder, welder operator and weld procedures in accordance with ANSI B31.3
 - 1.5.2 Product data: Submit manufacturer's technical product data for each size of pipe and pipe fittings used. Include this data in the Maintenance Manual, in accordance with Section 01340, para. 1.3.2.
 - 1.5.3 "As-built" drawings: Provide the Contracting Officer "as-built" drawings showing location of piping and installed devices relative to the structural framework column lines. Also show locations of all pipe hangers, clamps, supports and attachments installed in accordance with Section 15140. Drawings shall identify all items and materials used. Drawings shall be in accordance with Section 01340, para. 1.3.4.
 - 1.5.4 Certification report: The contractor shall provide a certification report in accordance with Attachment 15060.1 (AEDC-ENGR-STD-T-2, Section 6).
- 1.6 Delivery, storage and handling: Provide factory-applied plastic end-caps on each length of pipe. Maintain end-caps through shipping, storage, and handling as

required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe.

- 1.7 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents.

1.7.1 American National Standards Institute (ANSI):

- a. B16.21-92 Nonmetallic Flat Gaskets for Pipe Flanges
- b. B16.5-96 Piped Flanges and Flanged Fittings

2. PRODUCTS

- 2.1 Piping materials: Provide piping rated for the intended application in accordance with ANSI B31.3.

- 2.2 Pipe fittings: Provide factory-fabricated fittings of type, materials, grade, class, and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, valve, or equipment connection in each case. All fittings are to be in accordance with MSS-SP-6-96, MSS-SP-25-93 and ANSI B16.5.

2.2.1 Piping 3 inches NPS and larger shall use butt weld fittings.

2.2.2 For piping under 3 inches, socket weld fittings are permitted.

- 2.3 Pipe hangers: Pipe hangers shall be as provided for in MSS SP-58 and MSS SP-69 and specified in Section 15140.

- 2.4 Miscellaneous piping materials/products:

2.4.1 Welding materials: Provide welding materials as required and in compliance with Section II, PART C, ASME Boiler and Pressure Vessel Code for welding materials.

2.4.2 Gaskets for flanged joints: Conform to ANSI B16.21 for raised face steel flanges. Gaskets shall be Garloc Gylon 3510 or equal. Manufacturer's product data shall be provided for Contracting Officer approval.

3. EXECUTION

- 3.1 Installation: Fabricate and install all piping in accordance with ANSI B31.3. Install pipe and fittings in accordance with recognized industry practices that will achieve leak-proof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible joints for disassembly and maintenance/replacement of valves and equipment.

- 3.2 Piping runs: Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate piping runs at the highest practical elevation to maximize future use of available floor space. Run piping in shortest route that does not obstruct usable space, does not present a tripping hazard to personnel (minimum clearance height of nine (9) feet from the floor) or block access for servicing the building and its equipment. Supports shall be hangers in accordance with Section 15140.
- 3.3 Welding: Pipe joints requiring welding shall be in accordance with ANSI B31.3.
- 3.4 Flanged joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets. Orient bolt holes to straddle the vertical center line, where possible.
- 3.5 Cleaning, flushing and inspecting: Clean exterior surfaces of installed piping system of dust and debris. Clean piping systems to remove slag and dirt, before proceeding with required tests. Inspect each run of each system for completion of joints, supports, and accessory items. Inspect pressure piping in accordance with procedures of ANSI B31.3.
- 3.6 Piping tests:
 - 3.6.1 General: Provide temporary equipment for testing, including pump and gauges. Test the piping system and remove control devices before testing. Do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating.
 - 3.6.2 Pressure test: Pressure test in accordance with ANSI B31.3.
 - 3.6.3 Nondestructive Examination (NDE): Perform NDE in accordance with ANSI B31.3. The Contracting Officer will approve the weld inspection plan submitted per Attachment 15060.1 prior to inspection.
 - 3.6.4 Repairs: Repair piping systems sections which fail required piping tests, by disassembly and reinstallation, using new materials to the extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
- 3.7 Paint all carbon steel piping in accordance with Section 09900.
- 3.8 Identify piping contents, pressure, and flow directions in accordance with Attachment 15060.2 (AEDC Safety Standard D-3).

END OF SECTION

1. GENERAL

1.1 Provide all supports and anchors properly sized and installed to adequately support any piping system, which must be modified.

1.2 The maximum spacing for supports in the piping system shall be as follows:

<u>Normal Piping Size</u>	<u>Maximum Spacing Between Supports</u>
Less than 2 inches	9 feet (ft.)
2 inches	13 ft.
3 inches	15 ft.
4 inches and above	17 ft.

1.3 Provide additional supports as necessary to support valves.

1.4 All supports shall be in accordance with ANSI B31.3. Contractor shall submit design calculations for the supports and anchors.

1.5 All structural welds shall be in accordance with AWS D1.1.

1.6 Reference documents: The publications listed below form a part of this specification to the extent referenced and has the same force and effect as if bound into the contract documents:

1.6.1 American Society for Testing and Materials (ASTM):

a. A36/A36M-94 Carbon Structural Steel

1.7 Related work: Painting, Section 09900.

2. PRODUCTS

2.1 Concrete anchors: Self-drilling expandable type.

2.2 Structural steel: ASTM-A-36.

2.3 Pipe hangers and supports: Comply with MSS-SP-58.

3. EXECUTION

- 3.1 Inspection: Examine area and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Contracting Officer.
- 3.2 Installation of hangers and supports:
 - 3.2.1 General: Install hangers, supports, clamps, and attachments to support piping properly from existing structures; comply with MSS SP-58 and MSS SP-69. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
 - 3.2.2 Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
 - 3.2.3 Provisions for movement:
 - 3.2.3.1 Install hangers and supports to permit freedom of movement between pipe anchors, and to facilitate action of expansion loops, bends, and similar units.
 - 3.2.3.2 Load distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
 - 3.2.3.3 Pipe slopes: Install hangers and supports to provide pipe slopes and so that maximum pipe deflections allowed by ANSI B31.3 are not exceeded.
- 3.3 Equipment supports: Install new equipment at location of existing equipment, using existing support system if possible. Provide additional support for this equipment if existing supports are not adequate.
- 3.4 Adjusting and cleaning:
 - 3.4.1 Hanger adjustment: Adjust hangers so as to distribute loads equally on attachments.
 - 3.4.2 Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

DIVISION 16
ELECTRICAL

1. GENERAL

1.1 Summary:

- 1.1.1 Division 16 work consists of providing equipment, materials, and labor to install two Variable Frequency Drive Systems and associated instrumentation and controls. The requirements for this equipment is contained in Attachment 16480.1.
- 1.1.2 Cutting and patching on the new control panels shall not occur. Determine in advance the proper panel openings for the work.
- 1.1.3 Work of the section includes, but is not limited to, the following in support of electrical work of this project:
 - a. Provide sealing for all wall, ceiling, and floor penetrations
 - b. Touch-up paint and finishes damaged during construction
 - c. Provide apparatus support brackets of welded construction
 - d. Clean up construction debris daily to maintain a safe working environment for others in the operations area
- 1.1.4 Do not scale electrical drawings for exact sizes or locations. Determine exact locations as work progresses.

1.2 Submittals:

- 1.2.1 Installation drawings: Develop and submit installation drawings prior to the beginning of work (see Table 01340.1).
- 1.2.2 Record drawings (as-built): Develop and submit as-built drawings after completion of work (see Table 01340.1). Show all changes, additions, and deviations from the original drawing.
- 1.2.3 Welding certificate: The contractor shall submit to the Contracting Officer a certified report of the records of qualification test of each welder and welder operator in accordance with ASME Boiler and Pressure Vessel Code, Section IX (see Table 01340.1). Welding procedures and welder qualifications shall be approved by the Contracting Officer before start of fabrication.

2. PRODUCTS

- 2.1 For metal parts of conduit, boxes, fittings, enclosures, hangers, straps, and screws use corrosion-resistant materials or material protected by corrosion-resistant materials.

3. EXECUTION

3.1 Installation:

- 3.1.1 Provide the bracing, shoring, rails, guards, and covers necessary to prevent damage or injury. Do not leave energized electrical items exposed or unprotected.

Protect work and materials from damage by weather and the entrance of water or dirt. Cap conduits during installation. Avoid damage to materials and equipment in place. Repair or remove and replace damaged work and materials. Deliver equipment and materials to the job site in their original, unopened, labeled containers. Store ferrous materials so as to prevent rusting. Store finished materials and equipment so as to prevent staining and discoloring.

- 3.1.2 Provide proper power taps, circuit conductors, overcurrent protection, motor controls, and all required associated electrical equipment to service mechanical equipment installed new on this job. Select and install electrical equipment in accordance with National Electric Code (NEC), and these specifications.

- 3.1.3 Provide inserts, hangers, supports, braces, and anchor bolts required for all work called for under this Division.

- 3.1.4 Prime and paint welded support hardware to prevent rust. Finish color shall match apparatus.

- 3.1.5 Prefabricate and install brackets, raceways, supports, and enclosures where possible to reduce plant downtime due to power outages.

- 3.1.6 Rack and train cables in cable trays, pullboxes, and enclosures to provide a safe, workmanlike installation.

- 3.1.7 Remove all conduit, wire, raceway, enclosures, and apparatus abandoned by this project. Flush finish all unused conduits embedded in concrete.

- 3.1.8 Where apparatus is removed or relocated, touch-up surface to be smooth and match existing adjacent finish.

- 3.1.9 Deliver all removed/used items to a site as directed by the Government Representative.

- 3.1.10 Develop and submit a check out and test procedure as required in section 16480.1 para. 4.2.3. Perform testing in the presence of the Government Representative or his designee. Furnish the instruments, devices, and equipment necessary for testing. Correct defects discovered during testing. Demonstrate that the equipment supplied will comply with this specification.
- 3.1.11 Develop and submit manuals that completely describe the operation and maintenance of the system. These documents are required is section 16480.1 para. 3.2.4.2 and para. 3.2.4.4.
- 3.1.12 Develop and submit a test and inspection report to certify compliance with the specification. These documents are required is section 16480.1 para. 4.2.5.

END OF SECTION

1. GENERAL

1.1 Summary:

1.1.1 Provide conduit and fittings as specified herein.

1.1.2 Coordinate new raceway installation with apparatus installation to minimize outage duration.

1.1.3 Modify existing busway as necessary to safely facilitate installation of LCI equipment.

1.2 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents.

1.2.1 Federal specifications (F.S.):

a. W-F-406E Fittings for Cable, Power, Electrical and Conduit, Metal Flexible, 1993

b. W-F-408E Fittings for Conduit, Metal, Rigid (Thick-Wall and Thin-Wall [EMT] Type, 1989)

c. WW-C-566C Conduit, Metal, Flexible, 1975

1.2.2 National Electric Code (NEC 1999):

Article 364-Busways

2. PRODUCTS

2.1 Materials:

2.1.1 Flexible metal conduit: F.S.-WW-C-566C.

2.1.2 Rigid galvanized steel conduit: UL 6-93.

2.1.3 Fittings for rigid metal conduit: F.S.-W-F-408D.

2.1.4 Fittings for flexible metal conduit: F.S.-W-F-406D.

2.1.5 Metal Busway Enclosure

3. EXECUTION

3.1 Installation:

3.1.1 Install exposed raceway, busway, cable tray, and conduit parallel or perpendicular to walls, structural members, or intersections of vertical

planes or ceilings. Install new busway in such a manner as to retain, as a minimum, the same elevation (from the floor) as the existing busway. This minimum acceptable clearance height also applies to modifications of existing busways. Complete conduit and raceway (including busway) installation prior to conductor installation. Develop and submit descriptive literature for all new raceways and fittings. Conduit fittings shall be of the Form 7 type with wedge nuts secured with cover screws and gaskets.

- 3.1.2 Arrange conduit and busways so it will not interfere with removing or servicing new or existing equipment. Hang raceways from the ceiling as high as practical, in order to reserve floor space for future equipment installations.
- 3.1.3 Install rigid conduit in accordance with the requirements of Article 346 of the NEC.
- 3.1.4 Provide conduit bushings in accordance with Article 346-8 of the NEC.
- 3.1.5 Make conduit bend radii in accordance with Table 346-10 of the NEC.
- 3.1.6 Support conduit with pipe straps, hangers, or clamps at intervals not exceeding those specified in Article 346-2 and 348-12 of the NEC.
- 3.1.7 Install flexible metal conduit in accordance with Article 350 of the NEC. In wet locations, install liquid-tight flexible conduit in accordance with Article 351 of the NEC. Use a short section of flexible conduit on components subject to vibration or periodic removal for maintenance.
- 3.1.8 Provide bonded expansion fittings across building expansion joints in floors and ceilings to ensure ground continuity.
- 3.1.9 Use stuff boxes and cork fittings to prevent entrance of water and debris during construction prior to completion of conduit installations.
- 3.1.10 Make conduit electrically and mechanically continuous in accordance with Articles 300-10 and 300-12, and ground in accordance with Article 250 of the NEC.
- 3.1.11 During installation of raceways, inspect interiors of raceways; remove burrs, dirt and construction debris. Close and secure all covers on fittings, wireways, and boxes.
- 3.1.12 Identify all raceways per AEDC Safety Standard D-3.

END OF SECTION

1. GENERAL

1.1 Summary:

1.1.1 Provide wires and cables as specified herein.

2. PRODUCTS

2.1 Materials:

2.1.1 Insulation: Maximum working voltage of 600V unless otherwise shown. Provide stranded copper conductor material. Provide UL type insulation for wires AWG No. 10 or smaller. Develop descriptive literature for all new wires and cables.

2.1.2 Wire markers: Preprinted self-adhesive bands. Other methods may be used if submitted and approved.

2.1.3 Wire ties: Nylon clinching clip type. Wire bundles in racks and cabinets shall have ties on not greater than 6-inch spacing and closer where wires fan out to terminal blocks. All wire bundles shall be supported with ties and mounting fasteners to relieve wire strain at the terminal blocks.

2.1.4 Conductors: All wires shall be of copper or tinned copper, and all conductors shall be stranded.

3. EXECUTION

3.1 Install wires and cables in conduit and in accordance with Article 300-17 of the National Electric Code (NEC). Complete conduit installation prior to pulling or installing wires and cables.

3.1.1 Make wires and cables mechanically and electrically continuous in accordance with Article 300-13 of the NEC. Cable shields shall be grounded at one end only.

3.1.2 All wire shielding shall be continuous. Where stripped for connection, shielding shall be cut clean. Provide means to prevent any damage to wire insulation during shield soldering. Wire exposed from shield shall be the minimum possible in order to provide maximum shielding.

3.2 Handling:

3.2.1 Protect wires and cables from physical damage to the conductor, insulation, and jacket by using a wire-pulling compound/lubricant during insertion into conduit/raceway.

- 3.2.2 Support wires and cables in vertical raceways in accordance with Article 300-19 of the NEC.
- 3.2.3 All cables shall be routed so that there are no bulges or entanglements. Wires and cables shall be grouped and maintained by spot ties where necessary to permit easy tracing of the cables. Clamp wires to prevent strain on terminals.
- 3.2.4 Wires passing through any structure shall be protected by cable clamps, rubber grommets, sleeving, or rubber extrusions, so that chafing will be prevented.
- 3.2.5 Comply with manufacturer's recommended minimum bend radius for each type of cable and conductor. When not specifically stated, minimum bend radius shall be eight times the diameter of the cable.
- 3.3 Identification: Identify all wiring and cables using cable markers per Section 16195.
- 3.4 Testing:
 - 3.4.1 Test each conductor for continuity using an ohmmeter for isolation from each conduit and all other conductors using a 500VDC megohmmeter.
 - 3.4.2 Do not energize any conductor prior to completing the required tests.
 - 3.4.3 Wires and cables failing to pass any test shall be removed completely and replaced.

END OF SECTION

1. GENERAL

1.1 Summary:

1.1.1 Provide electrical boxes and fittings when required to install electrical equipment and raceways.

1.2 Submittals:

1.2.1 Develop and submit descriptive literature for all wiring boxes.

1.2.2 Develop and submit descriptive literature for all pullboxes.

1.2.3 Develop and submit descriptive literature for all junction/control boxes.

2. PRODUCTS

2.1 Materials:

2.1.1 Wiring boxes: Galvanized, flat rolled sheet steel of types, shapes, and sizes, including box depths, to suit each respective location and installation; construct with stamped knockouts in back and sides, and with box covers and wiring devices.

2.1.2 Pullboxes: Made of code gauge sheet steel with screw-on covers; of types, shapes, and sizes to suit each respective location and installation, with welded seams and equipped with gaskets, stainless steel nuts, bolts, screws, and washers. Boxes shall be factory finished inside and out with gray prime coat.

2.1.3 Junction control boxes: Made of code-gauge sheet steel with hinged covers, sizes shall meet the requirements of NEC Articles 370 and 373. Boxes shall be finished inside and out with gray prime coat enamel. Finish coat shall match existing boxes.

3. EXECUTION

3.1 Installation:

3.1.1 Install boxes and conduit bodies in locations to ensure ready accessibility of electrical wiring. The installation locations must be coordinated with the Government Representative.

3.1.2 Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work. Prefab boxes prior to installation in order to minimize outage times.

- 3.1.3 Provide knockout closures to cap unused knockout holes where blanks have been removed.

END OF SECTION

1. GENERAL

1.1 Work of this section includes:

1.1.1 Termination of instruments and controls conductors.

1.1.2 Electrical connections for equipment.

2. PRODUCTS

2.1 Terminals: For connections to existing terminal strips; locking fork, vinyl insulated type. Sizes shall be determined by wire gauge and terminal block screw size. Thomas and Betts STA-KON or equal. Current transformer (CT) secondary connections shall be made with ring lugs.

2.2 Pigtail conductors: Crimp type, for quick connect/disconnect, male and female machined connectors, made of tin-plated copper, with matching thermoplastic insulator.

3. EXECUTION

3.1 Install electrical connections as shown on approved installation drawings.

3.2 Torque feeder terminations to manufacturer's stated values with ratchet type torque wrench.

3.3 Terminate all instrument and controls conductors to terminal block in equipment and operator's station using appropriately sized locking fork terminals. Current transformer (CT) secondary connections shall be made with ring lugs.

3.4 The use of conductor splices shall be prohibited. All connections shall be made at terminal blocks.

3.5 A Government representative shall witness connections and insulating to verify proper materials, tools, and workmanship. Unsatisfactory connections shall be removed and replaced by contractor.

3.6 Upon completion of installation of electrical connections, and after circuitry has been energized, test connections to demonstrate capability and compliance with requirements. Ensure polarity of each circuit is correct. Correct discrepancies at site, then retest to demonstrate compliance.

END OF SECTION

1. GENERAL

1.1 Summary:

1.1.1 Work included:

- a. Conduit and equipment supports
- b. Fastening hardware.

1.2 Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

2. PRODUCTS

2.1 Materials:

2.1.1 Support channel: Galvanized or painted steel.

2.1.2 Hardware: Corrosion resistant.

2.1.3 Concrete anchors: Self-drilling, snap-off type.

3. EXECUTION

3.1 Installation:

3.1.1 Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using self-drilling expansion anchors. Do not use spring steel clips and clamps.

3.1.2 Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls; and self-drilling anchors or expansion anchors on concrete surfaces.

3.1.3 Do not fasten supports to piping, duct work, mechanical equipment, or conduit. Do not use powder-actuated anchors. Do not drill structural steel members.

3.1.4 Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts. Paint steel supports with two coats of gray prime enamel.

3.1.5 Install free-standing electrical equipment on channel as required.

3.2 Conductor Runs: Locate conductor runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate

conductor runs at the highest practical elevation to maximize future use of available floor space. Run conductor in shortest route, which does not obstruct usable space, does not present a tripping hazard to personnel (minimum clearance height of nine (9) feet from the floor) or block access for servicing the building and its equipment. Supports shall be hangers in accordance with Section 15140.

END OF SECTION

1. GENERAL

1.1 Summary: Types of electrical identification work specified in this section include the following:

1.1.1 Electrical power and grounding conductors.

1.1.2 Equipment/system identification signs.

1.1.3 Nameplates and tape labels.

1.1.4 Wire and cable markers.

1.1.5 Conduit color-coding.

1.2 References: The publications listed below form a part of this specification to the extent referenced and have the same force and effect as if bound into the contract documents:

1.2.1 Federal Specification (F.S.):

a. L-P-387A Plastic Sheet, Laminated, Thermosetting, (For Design Plates), 1971

2. PRODUCTS

2.1 Materials:

2.1.1 Engraved plastic-laminate signs:

a. General: Provide engraving stock melamine plastic-laminate complying with FS L-P-387A, black face and white core plies (letter color) with mechanical fastening except where adhesive mounting is necessary because of substrate.

b. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive (General Electric - RTV102 or equal) where screws cannot or should not penetrate substrate.

2.2 Marking tape: 3/4-inch wide vinyl plastic electrical tape, Scotch 35 or equal. Provide colors as indicated in 3.1.5 of this section.

2.3 Conduit labels: Sized and identified in accordance with AEDC Safety Standard D-3. (ATTACHMENT 15060.2) Panduit type PCV Style A or Thomas & Betts type WCEM Style A or equal.

3. EXECUTION

3.1 Installation:

- 3.1.1 General: Install electrical identification products as specified herein, in accordance with manufacturer's written instructions and requirements of ANSI/NFPA 70-99 and AEDC Safety Standard D-3. (ATTACHMENT 15060.2)
- 3.1.2 Coordination: Install identification after completion of painting when identification is to be applied to surfaces that require finish.
- 3.1.3 Conduit identification: Apply color-coded identification on electrical conduit in a manner similar to piping identification when electrical conduit is exposed in spaces with exposed mechanical piping. Use orange as coded color for conduit.
- 3.1.4 Open live equipment: Install danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power voltages higher than 110-120 volts.
- 3.1.5 Cable conductor identification: Apply cable/conductor identification on each cable/conductor in each box/enclosure/cabinet where wires are present. No cable/conductor identification shall be duplicated. Wire numbers shall be assigned by a "destination address" format. Also color code DC voltages: Positive - red and Negative - black and 120 vac voltages: Positive - black, Neutral - white, and Ground - green.

END OF SECTION

AEDC STANDARD PRESSURE PIPING

**ARNOLD ENGINEERING DEVELOPMENT CENTER
ARNOLD AIR FORCE BASE, TENNESSEE**

T-2 REVISION RECORD

[illegible]

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6.0 CERTIFICATION REQUIREMENTS

6.1 INTRODUCTION. Certification is required for all non-Category D pressure systems (See 1.2.3). A pressure system is certified when inspection, analysis, and testing are performed and documented in accordance with the requirements of this section. Certification of a new system requires development of data by the design, fabrication, inspection, and test contractor(s). Certification of an existing system whose history is not well documented, may be accomplished through reverse engineering/analysis, inspection, and test. Existing systems shall be certified as resources become available or when modified (See 1.3.2). Certification documentation for pressure systems, provided in a Certification Report, shall be retained by the support contractor responsible for the pressure system.

6.2 CERTIFICATION REPORT. The Certification Report includes documentation verifying that a pressure system was designed, inspected, and tested in accordance with AEDC-ENGR-STD-T-2 and is safe for operation at AEDC. The format and content of the Certification Report are as follows:

6.2.1 Section 1. Project Plan. This section defines the technical approach used to certify the piping system. This section shall include a description of the system, the design and operating conditions of the system, as well as man-hour estimates and schedule

6.2.2 Section 2. Identification. This section shall include fabrication or construction drawings, Welding Procedure Specifications and Welding Procedure Qualification Records, and Manufacturer's Data Reports for components. For existing systems, the documentation may not be available and will require additional information specified in 6.2.3. Required data for new systems includes:

- a. Designer, manufacturer, inspector, and tester's name and address.
- b. Procuring specification or contract.
- c. Revision of drawings for which the system was designed and fabricated.
- d. Drawing numbers.
- e. Dimensions and details of fabrication sufficient to determine component thicknesses.
- f. Design code (including section, division, revision date, and applicable addenda), or design basis.

- g. Corrosion allowance.
- h. Identification of materials and their yield and ultimate tensile strength values.
- i. Efficiency of welded joints.
- j. Method and extent of non-destructive examinations performed. Acceptance and rejection criteria.
- k. Types of pressure tests (e.g., pneumatic, hydrostatic) performed. Location and date of test(s).

6.2.3 Section 3. Evaluation and Analysis. This section shall include calculations performed to develop new system design or verify existing system design. When certification of an existing system is required, cyclic conditions and operating environments shall be included in the evaluation and analysis. A combination of fatigue, fracture and finite element analyses may be used to analyze indications identified during nondestructive evaluation (NDE).

6.2.4 Section 4. Inspection and NDE. This section shall include inspection and NDE Plans and Reports prepared by the manufacturer or inspector. A weld map identifying major components of the system and approximate weld locations is required. NDE Reports shall be traceable to the weld map with field configuration. It shall also include radiographic film to be retained by the system support contractor for the life of the system or as specified in the system ISI/T Plan. New systems shall meet inspection and NDE requirements identified in the applicable Code. Existing systems shall meet the following:

- a. **Magnetic Particle Examination (MT).** All branch, socket, and support welds that are suspect due to modifications and anomalies detected during visual inspection. Liquid penetrant test (PT) shall be substituted if the piping and/or components are manufactured of a nonferritic (nonmagnetic) material.
- b. **Radiographic Examination (RT).** At least 10 percent of all butt welds. For each weld rejected, an additional 2 welds shall be inspected. Replacement of piping shall be considered when rejection rate is greater than 25 percent of inspected welds. NOTE: Although radiography is the preferred volumetric examination method, in some cases Ultrasonic Volumetric Examination (UTV) may be substituted or used to augment radiography.

- c. **Ultrasonic Thickness Measurement (UTT).** Thickness measurements to determine pipe schedule and to detect thinning or corrosion, particularly at elbows shall be made.

- 6.2.5 Section 5. Deficiency Correction.** Documentation of corrections made as a result of inspection or analysis in 6.2.2, 6.2.3, and 6.2.4. Documents shall include repair procedures used, NDE Reports, revised drawings, and additional calculations as necessary.
 - 6.2.6 Section 6. Final Certification Tests.** Pressure system test certificates (See Figures 6.1 and 6.2) shall be completed for each test. This section shall include documentation verifying pressure system relief devices/pressure gauges have been pressure tested or calibrated for the intended service. Relief device certificates shall specify model number, serial number, set points, orifice size, flow capacity verified, and signature of test technician. Gauges shall be checked against a calibrated gauge during system pressure test.
 - 6.2.7 Section 7. In-Service Inspection/Test Plan.** This section shall include the ISI/T Plan developed for each pressure system certified. The format of the ISI/T report is provided in Figure 6.3.
 - 6.2.8 Section 8. Summary of Conclusions and Recommendations.** This section consists of any other additional data necessary to document the certification, such as a Physical Configuration Audit (PCA) certificate.
- 6.3 In-Service Inspection/Test (ISI/T).** To maintain confidence in the safety of certified systems, an in-service inspection test program shall be established and executed. The comprehensive ISI/T program will include certification and projected operating requirements, combined with the monitoring of defects permitted to remain in the systems. Routine monitoring of known flaws, which were deemed to be acceptable with ISI monitoring, shall be performed to assure that the discontinuity has not progressed to an unacceptable condition. ISI/T program requirements and frequencies shall be based on the failure mechanisms (pressure, thermal, vibration, fatigue, corrosion, etc.), system configuration, and performance requirements. Figure 6.3 gives details of a sample ISI/T program planning matrix.

PRESSURE TEST CERTIFICATE - NEW PIPING		
1. PROJECT TITLE _____		
2. JOB NO. _____	3. WORK ORDER NO. _____	4. DRAWING NO. _____
5. DESCRIPTION OF SYSTEM TO BE TESTED _____ <div style="height: 100px; border: 1px solid black; margin-top: 5px;"></div>		
6. SYSTEM SPECIFICATIONS APPLICABLE PIPING CODE _____ DESIGN PRESSURE = _____ PSIG TEMPERATURE RANGE _____ TO _____ DEG F	7. TEST TEMPERATURE TEST MEDIUM _____ DEG F TEST ARTICLE _____ DEG F	8. TEST PRESSURE _____ PSIG
9. TYPE OF TEST: <input type="checkbox"/> HYDROSTATIC <input type="checkbox"/> PNEUMATIC <input type="checkbox"/> MEDIUM _____		
10. APPROVAL <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div>ENGINEERING _____</div> <div>DATE _____</div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div>PRESSURE COMMITTEE/SAFETY _____</div> <div>DATE _____</div> </div>		
11. PRE TEST CHECKLIST <div style="height: 100px; border: 1px solid black; margin-top: 5px;"></div>	DATE _____	
12. PRESSURE TEST CHECKLIST <div style="margin-top: 10px;"> STEP 1. BEGIN PRESSURIZATION GRADUALLY STEP 2. INCREMENTAL INCREASE 25% TEST PRESSURE _____ PSIG HOLD TIME _____ MINUTES _____ 50% TEST PRESSURE _____ PSIG HOLD TIME _____ MINUTES _____ 75% TEST PRESSURE _____ PSIG HOLD TIME _____ MINUTES _____ 100% TEST PRESSURE _____ PSIG HOLD TIME _____ MINUTES STEP 3. DEPRESSURIZE TO DESIGN PRESSURE _____ PSIG HOLD TIME _____ MINUTES STEP 4. FINAL CHECK COMPLETED <input type="checkbox"/> SATISFACTORILY <input type="checkbox"/> UNSATISFACTORILY </div>		
13. TEST REMARKS AND FINDINGS <div style="height: 100px; border: 1px solid black; margin-top: 5px;"></div>		
14. POST TEST CHECKLIST <div style="height: 100px; border: 1px solid black; margin-top: 5px;"></div>	ORG. _____	DATE _____
15. TEST PERFORMED BY _____	ORG. _____	DATE _____

GC-648A (3/99) (EF)
PREVIOUS EDITION IS OBSOLETE.
INSTRUCTIONS ON REVERSE

Figure 6.1A Pressure Test Certificate For New Piping.

PRESSURE TEST CERTIFICATE--NEW PIPING INSTRUCTIONS

Note: Steps 1-10 will be completed by the system operating/responsible contractor's design/system engineer.

1. Project title including system/subsystem name and system number.
2. Job number to track project/accounting.
3. Work order serial number.
4. Manufacturer's design drawing number.
5. Identify the portion of the system to be pressure tested. Describe the location of isolation points, required valve position configurations, and other points.
6. Specify design pressure of piping system using applicable codes (i.e., ASME/ANSI B31.1, B31.3, B31.5, etc.).
7. Specify the required test media and test article temperature.
8. Specify the test pressure using requirements of applicable code (i.e., ASME/ANSI B31.1, B31.3, B31.5, NB-23, etc.).
9. Check block for hydrostatic or pneumatic. Enter the test fluid being used.
10. Signature of responsible contractor's Design/System Engineer, and Pressure Committee/Safety Representative.
11. The pre-test checklist shall include, but not be limited to, the following: (NA is not applicable to pressure tested).
 - a. Obtain work clearance.
 - b. Configure valves.
 - c. Apply/install isolation points (blinds, skillets, etc.).
 - d. Inspect test equipment. The constructor will provide the following as a minimum:
 - a source of pressure equal to or greater than the test pressure.
 - a calibrated pressure gauge within 90 days prior to test having a range equal to minimum of 1-1/2 times the test pressure.
 - all necessary blinds, caps, etc., required to isolate the system under test.
 - suitable relief devices or other methods to prevent the pressure from exceeding the capability of the system being tested. (The relief will be set at 110% of the test pressure and checked within 90 days of test).
 - a safe means to vent the system pressure. Examine all test equipment for tightness.
 - e. Piping systems designed for vapor or gas shall be provided temporary supports, if necessary, to support the weight of the test liquid if hydrotesting.
 - f. Expansion joints shall be provided temporary restraint if required for additional pressure load under test, or shall be isolated from the test. Sign the block and date upon completing.
12. Increase the pressure gradually to the present pressure levels and hold at each for two (2) minutes minimum. Gradually increase to the one hundred percent test pressure level. Hold for ten (10) minutes and then gradually decrease the pressure to the design pressure, whichever is applicable, and perform inspection for leaks. Indicate the test results by checking the appropriate box of Step 4. Should leakage occur, mark locations and depressurize the piping. Do not attempt to effect repairs, however minor, while piping is pressurized. Retest after repairs.
13. Explain unsatisfactory test results in sufficient detail to develop repair action or other disposition.
14. Reduce pressure to zero, disconnect test apparatus, drain pipe, and follow work order instructions for further disposition of piping system. Sign and date block upon completion of post test checklist.
15. Enter signature of test supervisor and/or quality representative and date.

Figure 6.1A. Concluded.

Figure 6.1B. Pressure Test Certificate For Repair Piping.

PRESSURE TEST CERTIFICATE--REPAIR PIPING INSTRUCTIONS

Note: Steps 1-10 will be completed by the system operating/responsible contractor's design/system engineer.

1. Project title including system/subsystem name and system number.
2. Job number to track project/accounting.
3. Work order serial number.
4. Manufacturer's design drawing number.
5. Identify the portion of the system to be pressure tested. Describe the location of isolation points, required valve position configurations, and other points.
6. Specify design pressure of piping system using applicable codes (i.e., ASME/ANSI B31.1, B31.3, B31.5, etc.).
7. Specify the required test media and test article temperature.
8. Specify the test pressure using requirements of applicable code (i.e., ASME/ANSI B31.1, B31.3, B31.5, NB-23, etc.). The minimum pressure shall be the operating pressure if tested per NB-23.
9. Check block for hydrostatic or pneumatic. Enter the test fluid being used.
10. Signature of responsible contractor's Design/System Engineer, and Pressure Committee/Safety Representative.
11. The pre-test checklist shall include, but not be limited to, the following: (NA is not applicable to pressure tested).
 - a. Obtain work clearance.
 - b. Configure valves.
 - c. Apply/install isolation points (blinds, skilllets, etc.).
 - d. Inspect test equipment. The constructor will provide the following as a minimum:
 - a source of pressure equal to or greater than the test pressure.
 - a calibrated pressure gauge within 90 days prior to test having a range equal to minimum of 1-1/2 times the test pressure.
 - all necessary blinds, caps, etc., required to isolate the system under test.
 - suitable relief devices or other methods to prevent the pressure from exceeding the capability of the system being tested. (The relief will be set at 110% of the test pressure and checked within 90 days of test).
 - a safe means to vent the system pressure. Examine all test equipment for tightness.
 - e. Piping systems designed for vapor or gas shall be provided temporary supports, if necessary, to support the weight of the test liquid if hydrotesting.
 - f. Expansion joints shall be provided temporary restraint if required for additional pressure load under test, or shall be isolated from the test. Sign the block and date upon completing.
12. Increase the pressure gradually to the percent pressure levels and hold at each for two (2) minutes minimum. Gradually increase to the one hundred percent test pressure level. Hold for ten (10) minutes and then gradually decrease the pressure to the design pressure, whichever is applicable, and perform inspection for leaks. Indicate the test results by checking the appropriate box of Step 4. Should leakage occur, mark locations and depressurize the piping. Do not attempt to effect repairs, however minor, while piping is pressurized. Retest after repairs.
13. Explain unsatisfactory test results in sufficient detail to develop repair action or other disposition.
14. Reduce pressure to zero, disconnect test apparatus, drain pipe, and follow work order instructions for further disposition of piping system. Sign and date block upon completion of post test checklist.
15. Enter signature of test supervisor and/or quality representative and date.

Figure 6.1B. Concluded.

INSERVICE INSPECTION/TEST MATRIX

Description	Initial Description	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Vessel											
Piping											
Supports											
Pressure Gages											
Relief Gages											
Regulators											

Inspection and Test Methods					
RT	=	Radiographic Examination	CRVT	=	Relief Device Certification
UTT	=	Ultrasonic Thickness Measurement	C	=	Calibration
VE	=	External Visual Examination	PT	=	Liquid Dye Penetrant Exam
VI	=	Internal Visual Examination	MT	=	Magnetic particle Exam
UTV	=	Ultrasonic Volumetric Examination	H	=	Hydrostatic Leak Test
P	=	Pneumatic Leak test	R	=	Recertificaiton Required
CIVR	=	Configuration Item Verification Review			

Figure 6.2 ISI/T Program Planning Matrix.



Safety, Health, and Environmental Standard

IDENTIFICATION OF PIPING SYSTEMS

SCOPE/APPLICATION

1. Piping systems must be identified uniformly based on either ANSI Standard A13.1, Scheme for the identification of Piping Systems, or MIL-STD-1247, Identification of Pipe, Hose, and Tube Lines for Aircraft, Missiles, and Space Systems.
 - 1a. Plant and test equipment piping up to the point of interface with the piping leading to the test article must be identified in accordance with the method described below,
 - 1b. Piping from the point of interface must be identified according to MIL-STD-1247, which is available from the Technical Library.
 - 1c. Each valve must bear the manufacturer's name or trademark and the reference symbol to indicate the service conditions for which the valve was designed. (See Safety Standard D2, Pressure Vessels & Systems, and Engineering Standard T-3, Engineering Design and Drafting Practices, for identification of components of pressure systems.)
2. Piping that presents a bumping or tripping hazard must be marked with black and yellow stripes at the point of hazard. (See Safety Standard B I 0, Safety Signs & Markers.)

TERMS EXPLAINED

Piping Systems -- Piping or tubing of any kind including fittings, valves, and pipe coverings. In this standard, rigid electrical conduit is considered piping, whereas buried piping is excluded.

REQUIREMENTS

Color Band

3. Every pipe must be marked with a color band as listed below.

NOTE: Where many tubes are routed in a bundle, a single identification band around the bundle or a tag wired to the bundle is sufficient if all lines in the bundle contain similar materials and pressures.

- 3a. Fire Protection (Red) - Piping systems that convey fire protection and like materials, including sprinkler systems and all other fire fighting systems,
- 3b. Dangerous Materials (Yellow) - Piping systems that convey dangerous materials that are in themselves hazardous to life or property by virtue of pressure, temperature, flammability, toxicity, or asphyxiating properties.

- 3e. Safe Materials (Green) - Piping systems that convey safe materials that involve no hazard in their handling and are of no extraordinary value.
- 3d. Electrical Wiring (Orange) - Piping systems that convey electrical wiring such as light, power, telephone, alarm, and signal conduits.

Band Location

- 4. Color bands should be located at conspicuous places, preferably adjacent to valves, point of exit or entrance to areas, and on long runs at distances sufficient to identify contents readily. Color bands must be applied to the outside cover of insulated piping.
- 5. When a color band placed on the piping will be obscured by frost or other material, a metal tag must be substituted, mounted above or below the piping, whichever is most conspicuous. (See Annex A.) The tag should meet color, legend, and width requirements of a color band.
- 6. Paint, tape, or decal identification markings must not be placed directly on stainless steel or aluminum piping unless specified by the manufacturer to be compatible (non-corrosive) with piping material. Tygon, or metal tags fastened by wire, may be used.

Identity of Contents

- 7. Each color band must bear the name of the material or its abbreviation as shown in Annex A. For the class and abbreviation of materials not listed, consult contractor safety.

Flow

- 8. At each color band (except for conduit), the fluid's direction of flow must be indicated by an arrow.

Electrical

- 9. Color bands on electrical conduits must be marked ELECTRIC.

Pressure

- 10. Where desirable for tracing or other purposes, the working pressure in pounds per square inch should be shown below or beside the identity word.

Lettering and Numbering Specifications

- 11. Letters and numbers placed on color bands must conform to the following: (See Annex A for typical band installation.)

Outside Diameter of Pipe or
CoveringMinimum size of Legend,
Letters, and Numerals

Width of Color Band

Less than 3/4"

See Par. 12 below

Minimum of 6" but banding will
be sufficient to accommodate
lettering

3/4" to 1-1/4"

1/2"

1-1/2" to 2"

3/4"

2-1/2" to 6"

1-1/4"

Over 6"

2"

12. Abbreviations for the content word for piping under 3/4-in. outside diameter must be stamped or stenciled on a nonferrous tag securely fastened at each color band or an equivalent method must be used.
13. The lettering must be placed below the horizontal centerline of the pipe where pipelines are located some distance above the normal line of vision.
14. Lettering should be in the color combination listed below, If paint is used, it should conform to specifications in the Department of the Army, Corps of Engineers Manual CE-250, Painting,

General:

Lettering Color Band Color

White (I 7875) on Red (I 1 1 05)

Black (17038) on Yellow (13655), Orange (12246), Green (141 10)

15. In shops, offices, laboratories, or other areas where the interior is painted in accordance with company standards, piping colors may match walls, ceiling, etc-, to which the pipelines are affixed or are run adjacent thereto, but must be color-banded as above.
16. In test areas where interiors are not painted, piping colors may match the color of the machine, tank, or equipment from which piping leaves when on operating floors; or piping colors may match the dueling or general color scheme in auxiliary areas. But in both cases, piping must be color-banded as above.

Tanks and Vessels

17. Tanks and vessels, when considered as part of the piping system, must have contents identified on an appropriately sized rectangle using lettering and background coloring consistent with those used on piping identification.
18. Tanks and vessels that contain flammable material must be appropriately marked with signs that read FLAMMABLE - NO SMOKING, MATCHES, OR OPEN LIGHTS.
19. Tank vehicles must be marked in accordance with AFTO 36-1-3, Painting and Marking of USAF Vehicles.

20. Vessels that remain empty for a considerable period of time between tests should be marked EMPTY and have necessary precautions for opening the tank.

RELATED SAFETY STANDARDS

D2, Pressure Vessels & Systems

D4, Compressed Gas Cylinders

B2, Safety Tags

B3, Control of Hazardous Areas

B10, Safety Signs & Markers

REFERENCES

ANSI Standard A13.1

MIL-STD 1247

COE Manual CE-250

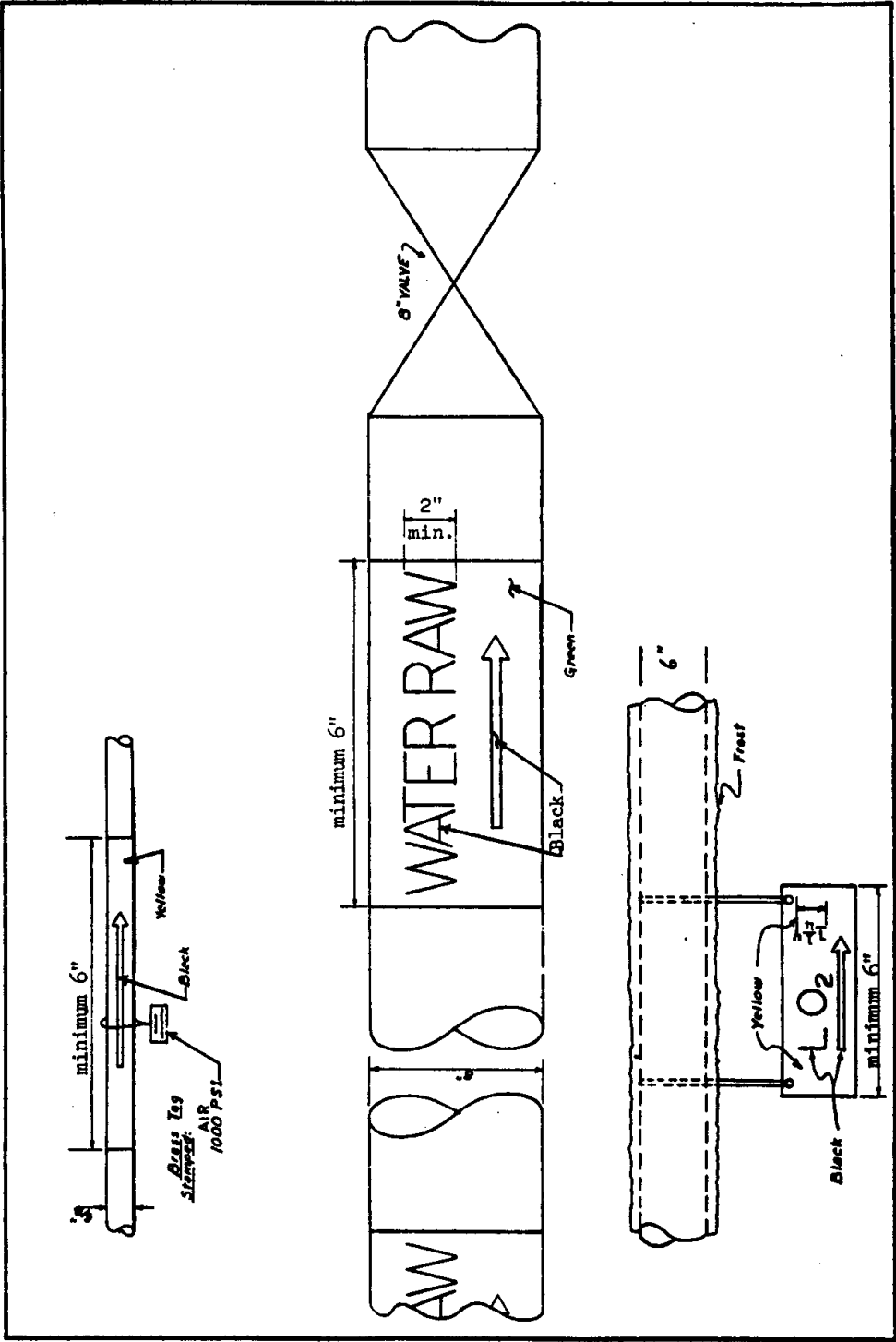
AFTO 36-1-3

AEDC Engineering STD T-3

CONTENT IDENTIFICATION

Material in Pipe	Abbreviation	Class	Band Color	Material in Pipe	Abbreviation	Class	Band Color
Air Compressed	Air	D	Yellow	Hydrogen Peroxide	HYDR-PEROX	D	Yellow
Alcohol	ALCOHOL	D	Yellow	JP Fuel	JP (N0.)	D	Yellow
Alcohol-Water Mix	ALCOHOL-Water	D	Yellow	Kerosene Liquified	KEROSENE	D	Yellow
Alkalies	ALKALIES	D	Yellow	Petrol Gas			
Ammonia	AMMONIA	D	Yellow	Lubricating Oil	LUB-OIL		
Ammonia	AMMONIA	D	Yellow	Monomethyl-hydrazine	MMH	D	Yellow
Ammonia	AMMONIA	D	Yellow	Natural Gas	NAT-GAS	D	Yellow
Anhydrous	GAS			Nitric Acid, Inhibit	IRF NITRIC	D	Yellow
Aniline	ANILINE	D	Yellow	Red Fuming	ACID		
Argon	ARGON	D	Yellow				
Backwash	Water,BW	D	Brown				
Water							
Brine	BRINE	S	Green	Nitric Acid, Inhibit	ACID	D	Yellow
				White Fuming			
Carbon Dioxide	C02	F	Red				
Chlorine	CLF3	D	Yellow	Nitric Acid Red	RF NITRIC	D	Yellow
Trifluoride				Fuming	ACID		
Contaminated	GW CONT	D	Light Green	Nitric Acid, White	ACID	D	Yellow
Groundwater				Fuming			
Drainage	DRAINAGE	S	Green	Fuming	ACID		
Electricity	ELECTRIC	E	Orange	Nitrogen, Gaseous	GN2	D	Yellow
Ethylene Glycol	ETHYL-GLYCOL	D	Yellow	Nitrogen, Liquid	LN2	D	Yellow
				Nitrogen, Tetroxide	N2O4	D	Yellow
Ethylene Glycol and water	ETHYL-GLYWATER	D	Yellow	Oxygen Difluoride	OF2	D	Yellow
				Oxygen, Gaseous	GO2	D	Yellow
Ethylene Oxide	ETHYLOXIDE	D	Yellow	Oxygen, Liquid	LO2	D	Yellow
Exhaust Gas	EXH-GAS	D	Yellow	Propane	PROPANE		
Finished Water	WATER, FW	D	Dark Blue	RP Fuel	RP (No.)	D	Yellow
				Sewage	SEWAGE	D	Yellow
Fluorine	FLUORINE	D	Yellow	Sodium-Potassium	NaK	D	Yellow
Freon (11, 12, etc.)	FREON (II, 12, etc.)	D	Yellow	Alloy Solvents	Specific chemical name	D	Yellow
Gasoline	GASOLINE	D	Yellow				
Halon	HALON	F	Red	Steam Toluene	STEAM TOLUENE	D	Yellow
Helium, Gaseous	GHe	D	Yellow				
Helium, Liquid	LHe	D	Yellow	Treated Water	WATER TREATED	D	Light Blue
Hydraulic Oil	HYD-OIL	D	Yellow				
Hydrazine	C-staff	D	Yellow	Trichloroethylene	TRICHLOR-ETHY	D	Yellow
Hydrate (45%) Ethyl Alcohol (50%)				Triethylaluminum	TEA	D	Yellow
Water (5%)				Water	WATER-DEM	S	Green
Hydrazine, Unsymmetrical	UDMH	D	Yellow	Demineralized			
Dimethyl				Water, Fire Line	WATER FIRE	F	Red
Hydrazine	AS-50	D	Yellow	Water, Potable Cold or Hot	WATER POT (Cold or Hot)	S	Green
Unsymmetrical				Water, Raw (Cooling), Cold or Hot	WATER,RAW (Cold or Hot)	S	Green
Dimethyl Hydrazine (50%) Mix				Xylidine (50%)	TONKA	D	Yellow
Hydrogen, Gaseous	GH2	D	Yellow	Triethylamine			
Hydrogen, Liquid	LH2	D	Yellow				

For other than fire protection purposes (for example, pressurization for transfer of fluid), C02 lines must be color-banded yellow, in view of asphyxia hazard.



BAND AND TAG LOCATIONS

2/15/01

ATTACHMENT 16480.1

PERFORMANCE SPECIFICATION

FOR

REPLACEMENT OF THE VARIABLE FREQUENCY STARTING SYSTEMS

FOR THE

ENGINE TEST FACILITY C-PLANT

ARNOLD ENGINEERING DEVELOPMENT CENTER
ARNOLD AIR FORCE BASE, TENNESSEE 37389-9998

1. SCOPE

- 1.1 Scope of Work: This Specification establishes the performance requirements to upgrade the Engine Test Facility (ETF) C-Plant facility with two new solid state drive systems, making ETF C-Plant's starting systems reliable and responsive for the next 25 years of operation. Additional features are specified to improve the solid state drive's monitoring, maintenance, production efficiency, and equipment life. (Note: In this specification, the solid state drive system will be referred to as the "drive" and is not to be confused with the motor/compressor drive train.) The contractor shall provide components as listed in section 3.4. The two new Variable Frequency Drive Systems (VFDS) shall meet the performance of paragraph 3.2.1 and 3.2.2.
- 1.2 Drive System Nomenclature: It is the understanding of the buyer that Load Commutated Inverters (LCI's) are the best design to accommodate the required performance at the frequency and power level specified in this document. Therefore, the drive system will be referred to as an LCI drive in this specification. This will not preclude the installation of other types of drive systems. But it will be incumbent on the contractor to meet the intent of the requirements in this specification to the satisfaction of the buyers.

2. APPLICABLE DOCUMENTS

- 2.1 Non-government documents: The following documents shall be a part of this specification to the extent specified herein. The documents will be referred to in the specification by the basic designation only.

2.1.1 Standards:

2.1.1.1 National Electrical Manufacturers Association (NEMA):

- a. ICS 3.1-98, Handling, Storage and Installation Guide for AC General-Purpose Medium Voltage Contactors and Class E Controllers, 50 and 60 Hertz.
- b. SG 4-90, Alternating-Current High-Voltage Circuit Breakers
- c. SG 5-95, Power Switchgear Assemblies
- d. TR 1-93, Transformers, Regulators and Reactors

2.1.1.2 American Society of Mechanical Engineers (ASME):

- a. B31.3-99, Process Piping

2.1.1.3 American Society of Testing Material (ASTM):

- a. A36-A36M-97, REV A Carbon Structural Steel.

2.1.1.4 Institute of Electrical & Electronics Engineers Inc. (IEEE):

- a. C37.20.1-93, Standard for Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear
- b. C57.13-93, Standard Requirements for Instrument Transformers
- c. C57.16-96, Standard Requirements, Terminology and Test Code for Dry-Type Air-Core Series-Connected Reactors
- d. C63.12-87, Electromagnetic Compatibility Limits – Recommended Practice
- e. 295-69, Standard for Electronics Power Transformers
- f. 428, Definitions and Requirements for Thyristor AC Power Controllers
- g. 444-92, Standard Practices and Requirements for Thyristor Converters for Motor Drives Part I – Converters for DC Motor Armature Supplies
- h. 519-92, Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
- i. 995-87, Recommended Practice for Efficiency Determination of AC Adjustable Speed Drives

2.1.1.5 National Fire Protection Association (NFPA):

- a. 70-99, National Electrical Code

3. REQUIREMENTS

- 3.1 Definitions: The Variable Frequency Starting System (VFSS) is an integrated system that functions as the starting mechanism for the axial compressor drive synchronous motors at the ETF C-Plant. The new VFSS must also have 20 MW continuous duty drive capability.

- 3.1.1 Interface drawings: The following drawings are for interface locations only. These drawings may not be complete or correct. It shall be the responsibility of the contractor to verify all dimensions in the field. New major components shall be arranged similar to the existing arrangement as shown on the interface drawings unless

otherwise approved by the Contracting Officer. Any additional interfaces shall be the responsibility of the contractor and must be coordinated with and approved by the appropriate System Engineer.

BBC drawings:

- | | | |
|----|--------------|---------------------------------|
| a. | HEIG 000 345 | Air/Exhaust Single line Diagram |
| b. | HEIG 000 349 | Air Side Equipment Layout |
| c. | HEIG 000 350 | Exhaust Side Equipment Layout |
| d. | HEIG 000 355 | Air Side Three Line |
| e. | HEIG 000 417 | Air Side Cable Layout |
| f. | HEIG 000 418 | Exhaust Side Cable Layout |
| g. | HEIG 000 363 | Air Side Bus Duct Layout |
| h. | HEIG 000 364 | Exhaust Side Bus Duct Layout |
| i. | HEIG 000 366 | Auxiliary Power Distribution |

Ferranti Packard drawings:

- | | | |
|----|--------|------------------------------|
| a. | 219462 | Input Transformer Nameplate |
| b. | 218777 | Output Transformer Nameplate |

DMJM drawings:

- | | | |
|----|-----------|--------------------------|
| a. | 4-20-M447 | Airside Piping Plan |
| b. | 4-20-M448 | Airside Piping Plan |
| c. | 4-40-M798 | Exhaust Side Piping Plan |
| d. | 4-40-M799 | Exhaust Side Piping Plan |

3.1.2 Major component list of existing equipment:

- a. Inverter
- b. Rectifier
- c. RC Network
- d. Busses and bus ducts
- e. Controls cubicle and Monitoring system
- f. Switchgear
- g. Input and Output Transformers
- h. DC Link/Reactor
- i. Cooling System

3.2 Characteristics: The following functional, performance, physical, and environmental characteristics shall be achieved.

3.2.1 Functional Characteristics:

- a. The new drive system shall be a 12 pulse rectifier and 24 pulse Load Commutated Inverter (LCI) to starting and control existing synchronous motors. The drive system shall provide 30MW starting capability and 20MW continuous duty variable drive

capability.

- b. The contractor will be required to provide new rectifier SCRs (and fuses if required), new inverter SCRs (and fuses if required), the cooling system, and new system controls. System controls refer to all functions performed in the A151/A251 Controls Cabinet and include:
 - 1) Start-up sequence control
 - 2) Alarm and trip annunciation for the drive and auxiliaries
 - 3) Low voltage AC and DC power distribution and protection
 - 4) Start-up/drive voltage and current regulation
 - 5) Input and Output Breaker control
 - 6) Synchronization with the Run bus
 - 7) Motor protection during starts
 - 8) Motor rotor position encoder excitation and development
 - 9) Fault protection
 - 10) Auxiliaries control
 - 11) Communication with remote devices
 - 12) Relay I/O
 - 13) Speed and voltage displays
- c. Electro Magnetic Interference will not be tolerated and must be avoided. Heat production due to harmonic distortion in transformers, motors, etc is not expected to be a problem while the drive system is operating as a starting system. But harmonic distortion measurements are to be made of the existing system and also for the new drive and an analysis performed to determine whether filters will be required to meet IEEE 519 when the system is used as a drive in the future. Filters will not be required as a part of this contract if the new system meets IEEE 519 for starting systems.
- d. The input and output power transformers are expected to be reused. The following equipment may be reused if the contractor can show that those components will work in concert with the new equipment to provide a reliable/maintainable system with a life expectancy greater than 25 years.
 - 1. The input and output switchgear.
 - 2. The existing bus duct.
 - 3. The output RC network.
- e. Each drive is required to operate in the following three modes:

1. Mode One: defined as starting only air side motors with the airside drive and only exhaust motors with the exhaust drive.
 2. Mode Two: defined as using the airside drive for starting all motors (Air and Exhaust sides) and the Exhaust drive being isolated to permit maintenance.
 3. Mode Three: defined as using the exhaust side drive for starting all motors (Air and Exhaust sides) and the airside drive being isolated to permit maintenance.
- f. Each drive must be capable of: utilizing the existing bus tie circuit and starting any of the existing 18 main drive motors, one at a time, from -360 rpm to 3600 rpm, in approximately three minutes; continuous variable speed operation of one motor; being isolated for repairs.
- g. Following pre-ops, all motor starts shall be fully automated. A 'Start' shall consist of, 1) a motor selection and 2) a remote start command. "Fully automated" motor starts imply all breaker operations, speed control, field excitation, regulation, synchronization, transferring to the run bus, and system shutdown shall be automated. Manual control of a motor shall be restricted to remote control of motor speed only.
- h. If the drive system fails to synchronize a motor to the running bus, the drive system shall have the capability to resume the start effort with the motor at any speed and continue the start sequence to and through synchronization (run breaker closure).
- i. Motor braking and 6 pulse operation will not be required for this drive system.

3.2.2 Torque-Speed Performance:

- a. Each drive system shall transmit torque to any ETF C-Plant compressor shaft as specified by the Speed/Torque/Power Curve for the four different configurations as outlined in Appendix B.
- b. The overall continuous duty speed range of the drive system shall be 0 RPM to 3600 RPM.
- c. The drive controls shall automatically sequence the operation of all subsystems, components, and auxiliaries, with the exception of the bus tie circuit breakers which are only used for back-up operation.

- d. The drive systems shall be capable of accelerating the ETF C-Plant compressor systems to synchronous speed, synchronizing and transferring the motor to the running bus in a total of three minutes or less.
- e. When in Manual control, the drive system shall maintain a constant speed within $\pm 0.5\%$, when loaded or unloaded at a rate of 1 MW per second. The speed response under load to a speed command step change shall be less than 0.5% overshoot or undershoot.
- f. The drive system shall not load any existing ETF C-Plant compressor shaft over stresses (see Appendix B), based on existing safety factors, for any operating condition including run-up and acceleration, normal operation, deceleration, or short-circuit faults.
- g. The rotation direction of the drive motor shall be counter-clockwise when facing the drive end of the motor.

3.2.3 System Reliability and Maintainability:

3.2.3.1 Reliability: The drive shall provide commercial quality reliability with a design life of the drive, associated hardware, harmonic filters, reactors, and cooling systems of at least 25 years. The estimated duty of the new drive will be to complete 1200 starts per year and to operate as a continuous drive system for 1500 hrs/yr.

The Mean Time Between Failures (MTBF) of the drive system shall be greater than or equal to 20,000 operating hours for power components and 10,000 operating hours for control components.

MTBF is the mean number of hours during which all parts of the item perform within their specified limits, during a particular measurement interval.

3.2.3.2 Maintainability: The design shall emphasize features that simplify maintenance actions and minimize maintenance costs. This shall include ease of access features, avoidance of special tools and special craft skills, commonality of replacement parts, and clearly documented maintenance manuals and trouble shooting guides. Any parts or materials that are designated for replacement as normally

scheduled preventive maintenance actions shall be standard commercially available parts or materials.

Routine maintenance of the drive shall not exceed 8.0 hours per year, by design. Self diagnosis and interlock alarms shall be designed into the drive controls to monitor and indicate malfunctions. Components that may require replacement, calibration, or maintenance shall be easily accessible through hinged lockable doors. Mounting methods and fasteners shall provide for rapid and unobstructed removal and replacement of devices.

The drive system Mean Time To Repair (MTTR) shall be less than or equal to 6.0 hours for power components and 0.5 hours for control components. MTTR is the sum of corrective maintenance times (hours) divided by the total number of failures during a particular interval under.

- 3.2.3.2.1 Maintainability list: The contractor shall prepare a list of the replaceable components for the drives. This list shall include manufacturers' data and be grouped by system. Components shall be identified by the system schematic nomenclature and include drawing number, manufacture, model number, unit price, order number, quantity installed, and minimum quantity to be maintained as spare parts. The recommended minimum quantity shall be the quantity provided to comply with the requirements of para. 3.7.1.

System components should be fabricated using “off-the-shelf” components and equipment. The contractor shall provide procedures for ordering spare parts.

- 3.2.3.2.2 Maintenance manuals: The contractor shall develop and provide maintenance manuals required for maintaining all items furnished under this contract. The contractor shall note any operational or maintenance activities which increases or decreases the life of that component.
- 3.2.3.2.3 Descriptive literature: The contractor shall develop and provide descriptive diagrams and literature required detailing the operation and maintenance of all items furnished under this contract.

3.2.3.2.4 Shop Drawings and System Schematics: The contractor shall develop and provide the drawings required to maintain all items furnished under this contract.

3.2.4 Physical Characteristics: The new VFDS installation will be subject to the following:

3.2.4.1 Space limitations: All new equipment shall fit within the footprint of the existing VFSS in Buildings 929 and 903 as indicated on the contract drawings (Appendix A), with sufficient clearance space for maintenance and code compliance. Each shipping unit needs to be less than 12x8x25 feet to clear obstructions and allow placement of the new equipment into the VFSS room. But, it will be the responsibility of the contractor to verify clearances and develop an installation plan as required in section 3.6.2 taking into consideration any additional size/space restrictions.

3.2.4.2 Materials: Piping, valves, fittings, and related parts shall meet the requirements of ANSI B31.3. Materials shall be designed and rated for their intended use. Welder qualifications and procedures shall be in accordance with ANSI B31.3.

Products containing asbestos, lead, or Polychlorinated biphenals (PCBs) shall not be used or installed at Arnold Engineering Development Center (AEDC).

3.2.4.3 Enclosures: The drive shall be fabricated with a suitable enclosure to meet all safety and environmental conditions of the equipment. Enclosures are to be Drip-Proof, securable, and provided with doors for easy access for maintenance. The Contracting Officer shall have approval of the final drive arrangement and enclosure. Enclosures shall be as required by NEMA for specific locations, unless otherwise indicated in this Specification. Metallic materials shall be protected from corrosion. Equipment enclosures shall have the manufacturer's standard finish. Ferrous metals such as structural steel, anchors, bolts, braces, boxes, washers and miscellaneous parts not of corrosion resistant steel shall be hot-dipped galvanized after fabrication, except where other equivalent protective treatment is specifically approved in writing.

3.2.4.4 Identification and markings: Nameplates shall be permanently affixed or stamped to each major component.

Nameplates shall include the following information:

- a. Manufacturer's name
- b. Model number
- c. Serial number
- d. Size/rating data
- e. Design limits

Circuits rated 480 volts and above shall comply with the Occupational Health and Safety Agency Standards for warning signs locations. Where applicable, information plates shall be attached by corrosion resistant methods. Hand lettering and ink markings on self-adhesive tapes or tags are unacceptable.

3.2.4.5 Painting: All external surfaces shall be primed, painted, and sealed in accordance with Section 09900 of this specification.

Interior and exterior surfaces of all equipment shall be thoroughly cleaned by sandblasting, pickling/rinsing, etching, or other means as approved by the Contracting Officer. Surfaces shall then receive, in a timely manner, a rust-inhibitive phosphatizing or equal treatment. All outside surfaces shall be primed, filled where necessary, and receive a minimum of two coats of exterior paint. The drive, all associated equipment, and hardware shall be painted per manufacturer's standard color.

3.2.4.6 Environmental characteristics: The unit shall be designed for intermittent operation under controlled conditions. The unit shall be equipped with enclosures to prevent dirt, grease, oil, dust, or water from entering critical drive system components. All components shall be designed for operation at a 55°F minimum to a 110°F maximum ambient temperature and 95 percent humidity conditions.

Components shall be arranged and located to minimize interference during operation and maintenance and to maximize functional integration among components. All equipment shall be designed to provide a uniform floor load distribution not to exceed 250 lbs-per-square-foot.

3.2.4.6.1 Vibration: All mountings shall be designed to minimize vibration interaction between and among components. Vibration of any component shall not introduce resonant vibrations into any other component, of more than 0.5 in/sec.

3.2.4.6.2 Alignment: The contractor shall assume full responsibility to assure proper alignment of any components to minimize vibrations and metal strains. The contractor shall provide Piping/Bus Duct supports, expansion joints, and vibration dampers as required.

3.2.4.6.3 Noise: Noise generated by the drive system must be less than 78dB, measured 1ft from any drive system surface.

3.2.4.6.4 Electromagnetic Interference Control: The drive shall be provided with the necessary electrical filters to limit the conducted electromagnetic interference from entering the incoming and outgoing power and control lines.

The source of any RFI or EMI that can be audibly detected over the intercom or paging system or which can be detected to cause movement, mis-operation, or give false readings in any plant control or any plant controller instrumentation circuit must be located and eliminated.

The drive shall be provided with the necessary shielding, screening and metal enclosures to attenuate the radiated electromagnetic interference to levels that will not affect sensitive electronic and communications systems outside the boundaries of the drive equipment. The drive shall also be protected against radiated electromagnetic interference from other external sources.

Suppression of electromagnetic interference shall be accomplished to within the limits recommended in IEEE C63.12.

3.3 Design and construction Requirements:

3.3.1 Scope

The Contractor shall provide all engineering and design personnel, equipment, and materials for the development of the new drive system. This shall include system, subsystem, and component levels of effort. This shall also include demolition, installation,

and integration activities to interface the new system hardware with the existing facility in a safe, efficient, and timely manner.

3.3.2 Design Criteria and Methods:

The following criteria identifies various aspects of the design which will be required, but is not necessarily all inclusive of details needed for a completely operational system.

3.3.2.1 System Configuration: The Contractor shall design the optimum configuration in consideration of performance, reliability, simplicity, initial cost, life cycle cost, harmonic content mitigation, efficiency, space constraints, demolition/installation requirements, system downtime, maintainability, and implementation of the latest, proven state of the art technical designs and material developments.

3.3.2.2 Site Visits and Field Verification: The Contractor shall make sufficient site visits to gather all existing system information required to manufacture a drive system that will interface with existing site conditions.

Existing facility documentation including drawings, design calculations, and any other relevant information that is available will be provided to the Contractor upon request to assist in the design phase. These documents shall be for information only, and the Contractor shall field verify all information critical to the design and installation of the new drive system.

The Contractor shall make (and submit copies for information) recordings of the electrical power supply voltage and current harmonic characteristics at the Point of Common Coupling (PCC) to establish a baseline of the existing levels of distortion for determining the need for future harmonic filtering. The PCC is defined as the point where the existing Government-owned input transformer is connected to the 161 kV power.

3.3.2.3 Manufactured Components and Materials: Components and materials provided under this contract shall be products of manufacturers that regularly engaged in the manufacture of the specified products. Where two or more units of the same equipment class or items are furnished, the equipment shall be from the same manufacturer and shall be

interchangeable. All materials and equipment shall be new and free from defects at the time of contract acceptance.

Manufactured items and materials to be incorporated into the work shall be handled, stored, applied, installed, serviced, and used in accordance with the manufacturer's instructions and recommendations, unless specifically indicated otherwise.

3.3.2.4 Architectural Design: The design shall include provisions of satisfactory free space surrounding all mechanical and electrical equipment as appropriate to the overall system design. Convenient access space and clearance for repair and maintenance shall be provided, including any permanent or removable platforms required to maintain equipment. Allow sufficient space for replacement of components.

3.3.2.5 Structural/Civil Design: The Contractor's design shall include an analysis of existing foundations and structures to determine what, if any, modifications are necessary to safely accommodate the drive system and related equipment.

If modifications to the existing ETF C-Plant foundations, floors or ceilings are necessary, the Contractor shall employ a qualified, experienced structural engineer familiar with large foundation dynamics.

3.3.2.6 Electrical Design: The Contractor shall employ qualified, experienced electrical engineers familiar with medium voltage power distribution, solid state power conversion, large motor designs, filter networks, and digital control systems.

The Contractor's design shall include protective relaying using differential relays from the load side of input breakers Q11/Q21, Q12/Q22 to the drive. Hardware shall be provided in the appropriate locations for proper protection schemes of all drive and motor components.

The Contractor's design shall include grounding and ground grid details, conduit and equipment locations, interconnecting cabling/ductwork, low voltage power distribution, control, and monitoring.

The Contractor's design shall include control system details with interface and protection devices and logic. Remote operation of the drive system shall be implemented in the design. Process and instrumentation design shall provide for correct operation of all utilities and the monitoring and recording of voltages, currents, power (real and reactive) and other relevant system variables.

The electrical design shall include:

- a. Use of the existing (input and output) transformers.
- b. Control of the Q11 and Q12 input power breakers in the existing VFSS switchgear room. This design shall include control, monitoring, protection, and time/current coordination with the existing power distribution system.

Time/current curves shall be plotted on a single piece of graph paper for those devices starting at the AEDC 161 KV substation that are to operate selectively in series with each other using a common current scale, with current ratings at the lowest voltage level. Curves shall be plotted progressively as each circuit is studied, starting with the device furthest from the source. Each curve on the graph shall include tolerance band and shall show degree of coordination with each successive device. Adjustable and nonadjustable protective devices shall be coordinated to operate on the minimum current that will permit distinguishing between fault and load current in a minimum of time.

Time and current settings shall be selected for the adjustable devices that will operate in sequence with the nonadjustable devices to isolate a fault with a minimum of disturbance to the unfaulted portion of the system.

- c. Bus duct routing from the input/output switchgear to the drive system and other drive components. The design shall also include all instrumentation and control system wiring schematics and details.
- d. The monitoring and control system must integrate the power distribution protection and monitoring, drive controls, required utilities, motor instrumentation,

facility remote controls and data acquisition. Data shall be available to provide simple control and status interface to a facility operator. The complete system shall incorporate, as a minimum, a programmable logic controller (PLC), diagnostic and monitoring equipment, interposing relays, and signal conditioning to interface with the existing control system hardware.

The Contractor's electrical design shall identify all electrical interfaces between the new drive system and the existing ETF C-Plant sub-systems and components. The Contractor's design drawings shall indicate specific disconnection points of existing electrical systems, and show how the new drive system electrical systems are integrated into the overall facility.

3.3.2.7 Mechanical Design: The Contractor's design shall include calculations for system component sizing and equipment selection. The design shall coordinate location and size of all new lines and piping for the planned systems. The design shall account for all existing piping and utilities and shall resolve any conflicts between existing and proposed new work.

3.3.3 Engineering Studies and Calculations:

Engineering data required under this section shall include all calculations, computations, computer printouts, graphs, presentations, and details of design analysis. This shall be tabulated, organized, and bound in such a manner that all pertinent information such as weights, loads, limits, dimensional checks, references, and assumptions are easily and readily identified.

As a minimum, the following studies are required.

3.3.3.1 Short Circuit: The Contractor shall calculate three phase, line-to-line, and line to ground short circuit levels and X/R ratios at all major parts of the system. Provide single line diagram with bus and branch identification, as used in the study. Provide all calculation input data. Perform a protective device evaluation study to confirm all equipment is applied within published ratings, in consideration of the worst case short circuit fault current available. All calculations shall be performed using a documented, commercially available program.

3.3.3.2 Protective Device Coordination: The Contractor shall perform a protective device coordination study to select proper settings and device characteristics to provide optimum equipment protection, continuity of service, and complete selective coordination. Perform calculations to select proper burden class for current transformers. Furnish time/current curves for each protective device. Assume worst case short circuit fault current available for coordination margin determinations. Furnish breaker and relay settings in a tabulated format. Include drive control trip characteristics on time/current curves. Where harmonic content may affect relay operation if standard practices are employed, make specific provisions in the design and selection of components to assure proper equipment protection and selective coordination. Document any deviations from standard practices based on harmonic content impact.

3.3.3.3 Harmonic Analysis and Filter Design: The Contractor shall perform a harmonic analysis on the power system to determine harmonics at all levels of load, and design a filter (if needed) that complies with IEEE 519 recommendations for the drive when used for continuous duty. Submit the findings of this study for the operating contractor's files.

The installation shall provide connection and space accommodations required for any future filters. Show details of the filter design on the drawings and note as "Future".

3.3.3.4 Insulation Coordination: The Contractor shall determine and document the Basic Insulation Level (BIL), and Basic Switching Level (BSL) ratings, as well as surge protection equipment requirements for 'best practice' system design.

3.3.3.5 Motor and Compressor System Analysis: The Contractor shall provide a complete torsional analysis on the motor and compressor system, including determination of resonance points, critical speeds, forcing functions, and damping requirements. The torsional analysis shall include both linear and non-linear multi-mass computer models. Quantify the torque pulsations that would be imposed on the system, for normal and transient load cases, such as steady state full load torque, short circuit torque, acceleration and deceleration torques, and starting torque.

Select torque limiting devices, and maximum acceleration or deceleration rates for prudent system design.

The drive design shall be coordinated with the motor design to insure that torsional vibrations produced by the motor shall not produce any adverse affects (including torsional pulsations and vibrations) on the motor stator, rotor, bearings, couplings, gear units, shaft, foundation, and compressor. Data on the existing ETF C-Plant compressor system is provided in Appendix B, in the Reference Drawings, and upon request.

- 3.4 Major Component Requirements: The contractor shall be responsible for the integration of all major components. Any new or renovated equipment shall conform to the requirements stated below. These requirements do not apply to existing equipment deemed satisfactory by the contractor for use in the system. All existing electrical interfaces to these components shall be maintained.

- 3.4.1 Load Commutated Inverter or Comparable Drive System Technology: The Contractor shall design, manufacture, test, furnish, and install a drive to provide the proper voltage, current, and frequency to the drive motor. The drive shall be designed to operate in conjunction with existing power transformers. The starting system shall be complete with all power components, enclosures, wiring, software, and control system. The contractor shall submit system hardware data and design for approval by the Contracting Officer, 45 calendar days prior to critical design review. The contractor shall submit drawings in accordance with Section 01340, para 1.3.1.

- 3.4.1.1 Drive Design and Construction: The LCI shall be of the static type, and shall contain identical frequency conversion channels. It shall consist of line side converters, DC link reactors, and load side inverters. The drive shall be completely solid state, and shall be microprocessor controlled. All controls, interlocking, and diagnostic monitoring shall be integrated into digital logic that shall be hardwired or coded into a non-volatile configuration. The basic design and construction of the LCI shall include the following:

- a. The LCI shall have 12 or 24 pulse operation. The converter/inverter DC link power control shall be

designed to ensure smooth, automatic motor operation between 0Hz and 60Hz.

- b. Converters and inverters shall be designed and constructed to comply with IEEE 428, the applicable provisions of IEEE 444.
- c. Converters and inverters shall be phase controlled, solid state units, based on N+1 design. Their design shall be coordinated with that of the Power Transformers and the Drive System such that proper operation can be achieved.
- d. The converter and inverter bridge sections shall be of identical construction, and provided with surge protection between the input transformer and converter bridge. Thyristors and heat sinks shall be arranged such that an individual thyristor can be removed and replaced with ordinary hand tools, or with special tools provided by the Contractor under this contract. Maintenance access shall be provided in the enclosure compartment and thyristor stack such that no additional climbing equipment shall be required by maintenance personnel to change out any thyristor or associated circuit component.
- e. The converter and inverter shall be able to withstand a three-phase short circuit current until interrupted by normal breaker operation without damage to the circuitry.
- f. All thyristor circuits shall be designed to coordinate with peak voltage protecting snubber networks, and with di/dt and dv/dt networks such that the converter and inverter can operate continuously with one thyristor failed shorted in each converter bridge leg.
- g. Each thyristor shall incorporate a separate fiber optic circuit for monitoring the condition of the thyristor in the "On" and "Off" states. These fibers shall be compiled into a thyristor monitoring system that will indicate and announce a specified failure of a thyristor. This thyristor monitoring system shall be fully integrated with the drive control

microprocessor for firing, data logging, and interlocking functions.

- h. Each thyristor shall incorporate fiber optic trigger circuits for isolation and shall be continuously monitored by the thyristor monitoring system.
- i. The operating temperature of the thyristors shall not exceed 80 percent of maximum continuous junction temperature under rated conditions. Under fault conditions, the thyristor junction temperature shall not exceed the thyristor manufacturer's catalog data.
- j. Where internal connectors are used, they shall be different sizes, types, or uniquely keyed by function such that no improper insertion combinations are allowed.

3.4.1.2 Medium Voltage Power Connections: Medium voltage (600v-13.8kv) bus and terminal connections shall be as follows.

- a. All internal, medium voltage power interconnects shall be made with copper bus bars. Bus bars shall be welded where feasible. Silver or tin-plated joints with bolts and lock washers shall be used where welding is not feasible.
- b. All external medium voltage power conductors shall be provided with appropriate connections. The use of Bus Duct is preferred. If Cables are used, multi-grip compression type lugs must be utilized. The lugs and terminal spaces or cabinets shall be designed for cables or buses to carry the rated ampacity of the drive system.

3.4.1.3 Harmonic Distortion: The drive and its associated harmonic filtering system (if required) shall not cause voltage and current distortion or telephone influence factor (TIF) as recommended by IEEE 519 or as existing and baselined by the contractor. These measurements shall be made with up to date calibrated measurement devices, approved by the Contracting Officer. The Contractor shall be responsible for taking all measurements and providing the analysis to determine if and what quantity of harmonic filtering is required to meet the limits of harmonic distortion set by IEEE 519. Space and connections for any harmonic filters

must be included in the submitted design. The intent is to add filtering, if required, later if the drive is operated as a continuous duty drive. The contractor will be responsible for drive compliance during starting but not for continuous operation.

- 3.4.1.4 Fault Protection: The drive shall be designed and braced to withstand the maximum currents available under fault conditions. An electrical open circuit or short circuit on the load (motor) terminals of the drive shall not cause any damage to the drive, or to the Power Transformers.

System power protection must be provided with the new drive controls. Existing protection which must be replaced includes over-current, negative sequence current, low voltage, earth fault, loss of excitation, over excitation, over-speed, breaker failure, and converter differential. Drive controls shall also incorporate input/output transformer trip and alarm signals. This protection must be functional at all times.

- 3.4.1.5 Safety: The drive shall be designed and constructed to meet all safety requirements of NEMA ICS 3.1 and NFPA 70. All equipment shall be in grounded enclosures with no exposed energized parts or terminations. Maintenance access doors shall be provided. All access doors shall have provisions for padlocks to exclude unauthorized personnel. Interlock switches shall be employed where required to protect maintenance personnel. All non-current carrying metallic components or supporting hardware shall be grounded.

The drive shall incorporate a lockable power disconnect from the secondary side of the Input Power Transformer to provide lockout tag-out protection/isolation for personnel protection. The existing input switchgear currently provides that protection.

- 3.4.1.6 Low Voltage Connections: Low voltage bus and terminal connections shall be as follows.

a. All low voltage wiring between sub-components and devices within or on equipment enclosures shall be completely installed and verified, and appropriate circuit points shall be wired to barrier type terminal blocks for equipment interconnections. The blocks shall have 10

percent of the terminal points reserved as spares for future use.

b. All interconnecting wiring shall be contained within the drive enclosures. No external wire ways, conduits, or connections shall be permitted between enclosure sections. For connections between major components, suitable wiring methods shall be employed, appropriate with the voltage and ampere rating of the interconnections.

c. A suitable metal barrier shall surround low voltage wiring located in high voltage compartments.

d. Wiring internal to all compartments not otherwise enclosed in conduit or ducts shall be bundled together and routed vertically and horizontally throughout the enclosures.

e. Hinge wire shall be provided with a droop loop that allows rotation around the longitudinal axis of the conductors.

f. Terminations shall be made with ring tongue or spring spade, crimped lug terminals, or other approved method. In-line conductor splices shall not be used.

3.4.1.7 Ground Bus: All compartments and enclosures shall be provided with a copper ground bus that shall be connected to the ground bus in adjoining compartments or enclosures. This ground bus shall serve as the ground source to which the enclosure, circuit neutrals, shields, conduit, and non-electrified metal parts are solidly connected. The bus shall be at least 0.25 by 2.0 inches in size, and shall be designed to connect to the facility's ground grid.

3.4.2 DC Link Reactors: The DC link reactors shall be designed and constructed to comply with IEEE C57.16, NEMA TR1, and the following criteria. The DC link must safely and reliably meet the following criteria.

a. The reactors shall be air core or iron core. Terminals shall be silver or tin plated.

- b. The reactors shall be designed and connected by the Contractor to specifically optimize the harmonic cancellations, current ripple, and di/dt . The continuous current rating of the reactor shall be equal to or greater than the peak current of the connected converter/inverter.
- c. The maximum temperature of the reactor during continuous operation at full current shall not exceed 115 degrees C. The temperature of the terminals shall not exceed the rating of the interconnecting cable.
- d. Reactors shall withstand the mechanical stress and temperature rise associated with a fault current condition for the duration preceding normal breaker operation.
- e. The voltage rating of the reactors shall be suitable for the Contractor's design of the drive and the motor. The insulation level shall be the greater of that required by IEEE 444-Table 7, or IEEE 295-5.1.6.
- f. All metallic parts that are not in contact with live reactor conductors shall have provisions for grounding. Reactor enclosures shall be designed and fabricated to eliminate eddy current flow in all non-current carrying structures.
- g. Reactors shall be air or water cooled. All cooling equipment shall have interlocks to check operation prior to energizing the reactors, and to alarm in the event of a failure mode.
- i. Provide lifting lugs or eyes on each reactor.

3.4.3 Switchgear: The drive shall utilize appropriate switchgear to provide isolation, configuration and overcurrent protection. Existing switchgear may be utilized if it provides the required protection and serviceability. If existing switchgear is replaced, the switchgear shall be totally enclosed, metal clad, and contain all required equipment to operate and protect the drive. The switchgear shall comply with IEEE C37.20.1, NEMA SG5, and the following criteria.

- a. All breakers shall comply with NEMA SG4.
- b. The operating mechanism shall be of the stored energy type utilizing a spring charged by a universal type motor.

The mechanism shall be provided with a position indicator that gives positive indication of whether the breaker is open or closed.

c. The power source for closing and tripping the breaker shall be 125 VDC, and shall be obtained from an existing AEDC battery source.

d. The breakers shall be provided in rugged frames with wheels for withdrawal from the enclosure and rolling across the floor. A front panel shall be provided on the frame to shield personnel from high voltages when the enclosure door is open. The panel shall be removable for access to components when the breaker is out of the enclosure. The breakers shall also have the capability to be locked and tagged (out of service) in the withdrawn position to provide protection to personnel during service/maintenance operations.

e. Each breaker shall have the following auxiliaries installed:

- 1) Primary and secondary disconnect contacts for breaker withdrawal.
- 2) At least six spare electrically independent single pole auxiliary contacts which can be readily changed between form "a" and form "b" configuration. These contacts shall be in addition to any contacts required for control, indicating lights, interlocks, and drive operation.
- 3) Breaker operation cycle counter.

f. Switchgear compartments shall be completely wired with cable terminals, cable clamps, control bus, control power switch, and terminal blocks. Terminal blocks shall be readily accessible for the external connections of metal-clad switchgear.

Low-voltage wiring for controls and accessories shall be run to terminal blocks having numbered points to identify circuits. Low voltage wiring shall be run in conduit or wiring raceways to isolate the wiring from high-voltage circuits. Wiring connections shall be identified.

Each compartment of the switchgear assembly shall be identified by an identification plate engraved with circuit function and function designations.

Removable elements of the same type and rating in the switchgear assembly shall be physically and electrically interchangeable in corresponding compartments.

Removable elements of different voltages or current rating shall be configured to prevent insertion and operation in the wrong cubicle. Front-hinged panel shall be suitable for mounting instruments, relays, control switches, and indicating lamps.

Remote motorized-racking is required for new input breaker installation, should breakers Q11/Q21 & Q12/Q22 be replaced. This new system will be for moving the breakers into the operate position or into the test position if no provisions are made to de-energize all busses.

Interlocks shall be provided to prevent the withdrawal of the circuit breaker from its compartment when the stored-energy mechanism is in the charged position. The interlocks shall also prevent withdrawal of a closed breaker, prevent closure between test and operation positions, and prevent removal when the operation spring is charged. The shutters shall automatically cover the stationary primary disconnect contacts to prevent accidental contact with live terminals when the breaker is withdrawn. The shutters shall automatically open when the breaker is moved into the operating position.

A positive means to assure that breaker frames are grounded in the operation position, and during withdrawal and insertion shall be provided. A continuous rigid copper ground bus shall extend throughout the entire assembly and shall ground the stationary structure and equipment. Ground bus shall be capable of carrying the rated short circuit current of the protective devices in the switchgear assembly for a minimum period of one second.

The following local controls and indicators for each breaker shall be provided: Fuse block and fuses for the 125 VDC control power; Local test control switch, which shall be effective only when the breaker is in the test position; Red and green indicating lights to indicate whether the breaker

is open or closed; The red light shall be connected to indicate trip circuit continuity; A mechanical device to indicate when the breaker is in the operating position and when in the test position.

Provide a space heater with thermostatic control for each breaker compartment to inhibit condensation of moisture.

g. Switchgear assemblies shall be completely bussed utilizing electrical grade, high conductivity, insulated solid copper bus bar having a rectangular cross section. Main, riser and bus tap connections shall be uniformly positioned and phase sequenced in accordance with IEEE C37.20.1. Busses shall be supported and braced to withstand both electrically and mechanically the short circuit current ratings.

Termination and connection points of all bus bar in the switchgear shall be tin or silver-plated by an electroplating process. Silver or tin coating methods that do not use the flow of electric current as part of the process shall not be acceptable. After plating the contact surface shall not be sanded or otherwise abraded, but shall be cleaned with a soft cloth immediately prior to final assembly.

All bus bar connections shall be made using silicon bronze bolts with wide flat silicon bronze washers under the bolt head and nut. These connections shall be tightened and checked by use of a calibrated torque wrench. Other connection designs may be used with the Approval of the Contracting Officer.

h. Potential transformers (PT's) shall be mounted on drawout carriages in separate switchgear compartments. The high voltage terminals shall be disconnected and grounded when the carriage is withdrawn. PT's shall also have the capability to be locked and tagged in the withdrawn position. Primary current limiting fuses capable of interrupting a short circuit shall be provided on the carriage. The potential transformers shall comply with IEEE C57.13.

i. Current transformers (CT's) shall comply with IEEE C57.13, shall have a suitable means of grounding the frame.

- j. Sheet metal compartments shall be joined together to form a continuous structure. Sheet metal barriers, enclosures, and external covers and doors shall be constructed from cold-rolled carbon steel sheets of commercial quality not less than 14-gage, with stretcher-level flatness in accordance with ASTM A36/A36M.
- k. Access doors shall be flanged and equipped with grounds, stops, and door latching mechanism.

3.4.4 Instrumentation and Control: The instrumentation and control system shall consist of all control and interface circuitry integrated with all sensing, operating, protecting, displaying, and recording devices necessary to provide a complete and operable drive system as required by this Specification.

The drive control shall be comprised exclusively of modular, standardized, solid state components on plug-in printed or uniquely keyed pre-assembled circuit boards of industrial standard manufacture. The printed circuit cards shall be treated in accordance with standard commercial practices to protect the cards from moisture and vibration. The drive control shall be mounted in cubicles, using standard equipment frames with front and rear doors. Assembled cubicles shall be factory wired to connectors in the bottom or rear of the cubicles for interface to other components. The drive control shall be a self-contained, user friendly, digital controller, tuned to provide optimal and repeatable drive motor performance.

The microprocessor-controlled equipment shall be specifically designed for power conversion and drive control applications. The system shall have a minimum of two years operating experience in comparable drive system configurations. Prototype hardware or alpha/beta drive control software shall not be used. The operation of the drive system, routine changes of parameters, and the use of built-in diagnostic and monitoring programs shall not require the knowledge of any programming languages. The drive control functions shall be upgradeable as technology advances to modify, enhance or optimize sequence or control characteristics.

The drive controller shall incorporate a serial interface and portable terminal that allows configuration of drive system parameters. This shall include all tuning variables, software I/O instruction sets, and monitoring capabilities. In addition, data transfer capability such as copy to/from disk, and printing options shall be included. The terminal shall have the capacity to access

the drive system fault history, whether the drive is on or off-line, and display or print the fault history record.

The controls will be required to synchronize the starting bus frequency and voltage with the utility system frequency and voltage and issue the order to close the run breaker and open the start breaker at the appropriate time to minimize perturbations at the motor and on the utility. Out-of-phase transfers will not be permitted.

No local operation (except for testing) is to be required or permitted and must be disabled if provided.

Operational parameters and alarms are to be visible externally without opening doors. As a minimum the following devices shall be provided.

a. Indicators shall be provided for the following:

1. System in operation (Start in progress)
2. Input breakers closed.
3. Fault exists.
4. Alarm exists.

b. Analog displays shall be provided for the following functions.

1. Motor Speed
2. Exciter Current

The drive controller processor shall incorporate an independent watchdog circuit that monitors the processor scan function, and trips in the event that the processor stops.

The drive controller or PLC shall monitor the following signals, as a minimum, and shall provide the indicated action. Terminal and alarm displays are to be mounted at eye level (5' to 6' above the floor) with the keyboard or inputs adjustable for the convenience of the operator. These signals shall be interfaced with the Plant Controls as defined in Section 3.5.1. All fault codes or annunciations shall be in English language. The drive controller shall have a first fault feature that incorporates a memory circuit which identifies the first event of fault annunciation.

- a. Alarms: The following signals shall indicate a drive system alarm.
 - 1. Coolant low level
 - 2. Coolant high temperature
 - 3. Thyristor Failure
 - 4. No Start Permissive
 - 5. Enclosure Doors open

- b. Alarm/Trips: The following signals shall indicate a drive system alarm and initiate a drive trip or shutdown.
 - 1. Processor Watchdog Failure
 - 2. I/O Fault
 - 3. Source Phase Reversal/Loss
 - 4. Source side Commutation Failure
 - 5. Load Over Flux
 - 6. Load side Commutation Failure
 - 7. Loss of Field
 - 8. Overspeed
 - 9. Ground Fault
 - 10. Gating Supply Failure
 - 11. Coolant over temperature
 - 12. Coolant loss of Flow
 - 13. Coolant high conductance
 - 14. Loss of Speed Reference/Feedback
 - 15. Low Control Voltage
 - 16. Blown Fuse
 - 17. DC Link Reactor Malfunction
 - 18. Input/Output Transformer Malfunction
 - 19. Emergency Stop

The drive controller shall incorporate self contained, user-friendly, diagnostic capabilities, to continuously monitor the system for faults, provide pre-operational system checks before the motor is started, and provide extensive off-line troubleshooting.

The drive controller shall provide features to allow technicians to rapidly locate faults after an alarm has occurred and to monitor the proper function after the problem has been eliminated.

The drive controller shall include complete capability to perform built-in off-line test programs for local mode operation, line side bridge operation, load side bridge operation, and I/O simulation.

These test sequences shall be activated without additional software programming or modifications. The drive controller shall be capable of performing all troubleshooting at low (<480 VAC) or no voltage levels, and shall contain all hardware and software to exercise thyristor bridge circuits at low voltage levels.

The drive controller shall contain built in transient data recorders that hold at least 500 msec of analog data, up to 8 channels, that capture significant signals at the time of the fault occurrence for playback via the drive controller terminal.

I/O Requirements:

Discrete interface logic to the existing control system shall be high (24 VDC)= true, low (0 VDC)= false.

Analog interface signals to the existing data system shall be optically or galvanically isolated, 0-10 VDC, 0-24 VDC, 0 ± 10 VDC, or 4-20 mA, scaled to the corresponding engineering units. D/A converters shall be 12 bit or better resolution.

Hardwired circuits shall be fail-safe de-energized.

Exciter control will continue to be a requirement for the new drive system controls. Two discrete commands are 1) to command the exciter to be “under VFSS control” and 2) to turn “ON”. An analog signal regulates the exciter current to produce the appropriate back EMF required from the motor.

Motor speed from a tach is available if needed.

A motor position Encoder is currently being utilized and is available if needed. It uses a 1000 Hz excitation supply from the drive system and reads the three phase return inputs.

Run bus voltage is available for synchronization.

A discrete motor permissive approval must also be incorporated into the control logic permitting a start only during a “approve” state.

- 3.4.5 Cooling Unit: The Contractor shall provide a water-cooled or air-cooled cooling system for the drive. If the Contractor selects air-cooled the room temperature must not increase by more than 10

degrees Fahrenheit or increase humidity by more than 10 percent above ambient at the end of the mode test specified in section 4.3.5.3.

For water cooled systems, water to water heat exchangers shall be plate type heat exchangers, designed and provided to connect to the Government's existing cooling water system as shown on the reference drawings. The maximum cooling water available is 230 gpm at a temperature between 45 and 90 degrees Fahrenheit.

The drive cooling system shall provide redundant conductivity sensors.

The cooling system shall be sized to prevent the thyristor junction temperature from exceeding the maximum thyristor junction temperature permitted by the thyristor manufacturer under all operating conditions including fault conditions.

The system shall have a flow switch that shall initiate an trip for loss of flow. The cooling water temperature shall be monitored to initiate an alarm if cooling capacity is reduced to the point that the drive cannot operate at 100 percent rated output. In addition, a shutdown shall be initiated prior to any thermal damage to thyristors, resistors, capacitors, inductors, or any other device which may incur a shortened life expectancy from overheating.

If designed to use cooling water, the closed loop cooling system shall use de-ionized water. The cooling system shall have the capacity to cool all components and to maintain the resistivity of the de-ionized water for safe operation of the drive. The system shall have the capability to deionize 50% of the cooling water capacity from potable water within a span of three hours. No ethylene glycol mixtures shall be used. The cooling system shall utilize high-grade materials, which will not react with the deionized water or be expected to deteriorate in the 25-year life of the system.

The Contractor shall flush and clean all new cooling water piping after installation.

3.5 Plant Interfaces

3.5.1 Controls: The Contractor shall provide a complete plant control interface which integrates the drive controller section of the LCI with the existing plant/operator controls. Provisions shall be made to accept remotely generated motor/exciter parameters that are described in the reference drawings. The remote station will have

controls to allow the operator to start, stop and adjust speed of the drive system. The station will be active at all times, displaying drive system status, motor and other relevant system information. Start and speed control shall only be initiated from these remote signals, not at the local panel.

The controls may use a high-speed serial data to interface with the facility-wide automation system. A digital interface is not required as part of this contract, but the system hardware shall be designed to accept industry standard modules that can provide this feature.

3.5.2 Power Available for Utilization: The Government will provide 24VDC, 125 VDC and 480 VAC electric power for auxiliary power requirements. Power available for the drive system is two three-phase lines rated 5.18 kV at 2000 amps.

3.5.3 Cooling water: Interface to the existing cooling water lines as shown on the drawings in paragraph 3.1.1. Please reference Appendix C for information regarding 1999 C-Plant Raw Water Quality.

a.	Normal pressure	100 PSIG
b.	Maximum pressure	150 PSIG
c.	Minimum pressure	80 PSIG
d.	Design pressure	120 PSIG
e.	Design temperature	85 °F
f.	Maximum temperature	90 °F
g.	Minimum temperature	45 °F
h.	Maximum available flow	230 gpm.

3.5.3.1 Available Cooling Water: The Contractor shall determine the quantities of cooling water required for the new LCIs, and the DC link reactors. Cooling water calculations shall be based on a maximum inlet water temperature of 90 degrees F and a water inlet pressure that varies from not less than 80 psig to not more than 120 psig.

3.5.3.2 Cooling Water System Modifications: The Contractor is required to integrate the design of the drive system with the existing cooling water system. The Contractor shall provide the materials and labor to modify all interconnecting piping and devices for connecting the existing cooling water system to the new drive system equipment. An isolation valve shall be provided at the raw water system/drive interface. Arrange all piping as high as

practical (9' min) in order to reserve floor space for future equipment installations.

All modifications to the cooling water system shall be made in accordance with ASME B31.3.

3.6 Installation of the new drive system

3.6.1 General: The Contractor shall provide all engineering, labor, materials, and equipment to assemble, install, set-up and check-out the new drive system. The new drive system shall be completely installed and operational within a maximum available construction window of 3 months (including demolition of the existing equipment see 02070, 1.1.1.3). The Contractor shall be responsible for coordination with the Contracting Officer to abate any restrictions that would impede the work schedule (i.e. schedule conflicts with plant operation, security clearances, etc.). The Contractor shall provide factory representatives on-site for the installation phase of their respective components.

3.6.2 Site Installation Plan: The Contractor shall devise and submit a Site Installation Plan, for Approval by the Contracting Officer, 45 calendar days (see Table 01340.1) prior to the Critical Design Review (CDR). The Site Installation Plan shall identify the Contractor's installation scope and methods, and include the following details.

- a. Drawings and/or descriptions of the cranes, cribbing assemblies, and rigging assemblies proposed for the installation work.
- b. Installation procedures describing the step-by-step approach for the installation of each major component or sub-system.
- c. Installation schedule identifying the planned installation start date, duration, and interfaces of each major component or sub-system to be installed.

Methods must be taken to protect existing equipment adjacent to or near the installation area or in the equipment delivery path.

The Contractor shall not begin any installation work prior to the date assigned by the Contracting Officer. The site installation plan shall reflect these dates.

During the installation of the new equipment, measures must be taken to minimize the downtime of the operational VFSS.

The plan must also communicate the contractor's intention to supply his personnel with office space and telephone service. Portable phone use is not permitted on base. Staging areas for new equipment, tools, scrap, and spare parts must be addressed. The staging area and office area may be up to one mile from the installation local.

- 3.6.3 New Solid State Equipment: The drive shall be provided with all integral components and accessories completely installed, wired, and interconnected. A minimum amount of field connections shall be required for site installation of the system.

The Contractor shall provide all materials and labor necessary to completely install the equipment at the field site. The installation work shall include:

- a. Preparation and re-surfacing as required of the floor in Bldg. 929 and 903 prior to the drive installation.
- b. Rigging the new drive, movement of all equipment, removing wall panels and other interferences where needed to locate the new equipment to the existing VFSS location. Note: The ETF C-Plant, Air-Side and Exhaust-Side, building cranes maximum load/weight carrying capacity is 50 tons. The operating contractor will operate the crane but his time must be limited and scheduled.
- c. Assembly of the drive sub-systems and components into a fully integrated and functional unit.
- d. Connection of input conductors from the Input Transformer and the output conductors to the motor start bus.
- e. Interconnecting piping between the drive cooling system and the existing cooling water piping.
- f. Control interfaces in the interface cabinets A181/A281
- g. Interconnecting wiring between Auxiliary power supplies and the new equipment.
- h. Removal of all excess materials and equipment and replacement of building walls to as found condition.

The methods used for installing the new equipment shall be detailed in the Contractor's Site Installation Plan

3.7 Spare Parts and Special Tools

- 3.7.1 Spare parts are to be from multiple procurement sources, manufactured to military or industrial standards, and not require special tests, machining, matching, or other selective inspections.

The Contractor shall provide the following drive system spare parts as part of this contract. Similar components or subassemblies are to be provided as spare parts should a drive system design other than an LCI be utilized.

- a. One of each type of bridge leg or replaceable component if they are designed to be repaired in place.
- b. Firing module subassemblies.
- c. Snubber circuits or circuit components.
- d. One of each type of replaceable printed circuit boards.
- e. Replaceable cooling system elements such as filters, cartridges, and deionization resin bottle with resin.
- f. One of each type of sub components such as breakers, pumps, transducers, etc.
- g. Ten percent spares of consumable items such as light bulbs, switches, etc.

The Contractor shall configure and install all spare circuit boards and demonstrate operation of the drive to be identical to the baseline circuit board arrangement.

Salvaged items from the first VFSS will be protected and stored for use as spare parts for the second VFSS, until the second VFSS is removed from service.

3.7.2 Special Tools

Two of each special tool and special test equipment not otherwise commercially available which will be required for the maintenance, troubleshooting, testing, and repair of the drive system or other supplied equipment shall be furnished as part of this contract. The special tools shall be turned over to the Government at the completion of the commissioning phase.

The requirements of this section do not include activation and checkout parts required to complete section 4.3.5 of this Specification.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Responsibility for Tests: The contractor shall perform all inspection and test requirements. The Government will visually inspect new major components prior to shipment and after arrival at AEDC for compliance with this specification and submitted documents.
- 4.2 Factory Inspection and Tests: The Contractor shall assemble the drive and perform factory or on-site inspections and tests in accordance with the applicable industrial standards and codes, the Contractor's or manufacturer's standard practices, and the Contractor's Quality Assurance Plan.

Factory inspections and tests of the LCI shall include the following. If a drive system other than an LCI drive is provided, similar but appropriate tests will be required.

- a. Test converter and inverter in accordance with IEEE 444.
- b. Test thyristor firing circuits in accordance with manufacturers recommendations.
- c. Test DC link reactors in accordance with IEEE C57.16, except perform dielectric tests at the greater of the voltages required by IEEE 444 Table 7 or IEEE 295-5.1.6.
- d. Test instrument transformers in accordance with IEEE C57.13.
- e. Simulate and verify operation of all cooling system modes, interlocks, and alarms.
- f. Actuate each I/O point at the field termination wiring point to verify the wiring integrity and the functionality of the PLC I/O card.
- g. Simulate and verify operation of all control system modes, interlocks, and alarms.
- h. Calibrate all instrumentation.
- i. Test all microprocessor controller circuit boards, as appropriate, for the following functions.
 1. Power supply tolerances.

2. Logic manipulation and clock speed.
 3. Input/output points.
 4. A/D and D/A conversion rates and accuracy.
 5. Serial interface protocols.
 6. Non-volatile RAM manipulation.
- j. Simulate and verify conformance of all alarm and trip points in software and hardware.
 - k. Baseline existing power quality before removing the old VFSS. Measure the power quality after installation for the new drive system.
 - l. Inspect and test switchgear and circuit breakers prior to energization. Protective relays shall be set, and settings verified to operate in accordance with the manufacturer's time-current curves.

The Government reserves the right to witness any and all Contractor inspections and tests. The Contractor shall notify the Government in writing, 21 calendar days prior to the start of the inspections or tests.

The Contractor shall submit Certified Inspection Reports and Certified Test Reports no later than 21 calendar days after completion of the inspections or tests.

4.3 Contractor tests and verifications:

4.3.1 Scope

The Contractor shall supply all materials, test equipment, and personnel to demonstrate that the integrated drive system meets the performance requirements of Section 3.2. The drive system commissioning includes the following:

- a. Commissioning Plan.
- b. Sub-system inspections and tests.
- c. Integrated systems tests, at various power levels, for pre-determined periods of time.
- d. Demonstration of fault tolerance and failure modes.
- e. Commissioning test reports and final documentation.

- f. Technical support and training.

4.3.2 General Commissioning Requirements

- 4.3.2.1 Commissioning Personnel: The Contractor shall provide full time engineers employed specifically for drive system commissioning. These engineers shall be employed by the Contractor and shall not be sub-contracted personnel.

Site commissioning personnel shall have requisite experience in electrical equipment checkout and startup. All personnel shall be trained on the specific type of equipment used on this project, and shall be educated by the Contractor as to this specific project requirements and performance criteria.

A project engineer (commissioning engineer) shall be provided to oversee and coordinate all the Contractor's commissioning activities. The project engineer shall be on-site whenever commissioning tests are performed.

- 4.3.2.2 Test Equipment: The Contractor shall provide All test equipment. The equipment shall be calibrated and maintained in accordance with the Contractor's quality assurance program. Any data recorded on untraceable or expired calibration certified equipment will not be accepted.

- 4.3.2.3 Commissioning Parts: The Contractor shall replace or repair all damaged parts, consumables, defects, and warranty work associated with the drive system during commissioning.

- 4.3.2.4 System Measurements: The Contractor shall perform and document system measurements on the completely installed drive system to verify that the required system performance parameters have been met.

4.3.3 Commissioning Plan

The Contractor shall submit a Commissioning Plan, for Approval by the Contracting Officer, no later than 45 calendar days prior to the start of commissioning. The Commissioning Plan shall outline the testing procedure to bring the drive system on line in a safe and orderly sequence. The plan shall be written to progressively and conservatively increase the level of system complexity, power consumed, and integration with the existing plant systems. It shall

also be devised to progressively reduce risk and eliminate areas of uncertainty.

The Commissioning Plan shall include the following testing phases and details.

- a. Personnel, equipment, and facilities required by the Contractor to perform commissioning.
- b. Subsystem verification tests as outlined in para. 4.3.4.
- c. Integrated systems tests including no-load operation, initial drive train operation, mode tests, and load tests as outlined in para. 4.3.5.
- d. Pre-operations checklists.
- e. Test procedures and instructions.
- f. Test acceptance and sign-off.

4.3.4 Subsystem verification Inspections and Tests

Prior to commissioning the fully integrated drive system, the Contractor shall perform on-site subsystem tests of the individual drive system components and subsystems.

All initial tests shall be conducted at the lowest energy level required to perform the test. The Government and the Contractor shall both agree when each phase has been completed, and the drive system is ready for the next level of testing.

The Contractor shall perform subsystem inspections and tests in accordance with the applicable industrial standards and codes, the Contractor's or manufacturer's standard practices, and the Contractor's Quality Assurance Plan.

The contractor shall provide a factory trained technician to inspect (prior to start of work and after installation), adjust, repair (if required), and demonstrate performance of the unit after installation. AEDC shall provide all personnel to operate plant equipment/facilities.

The Contractor shall submit Certified Inspection Reports and Certified Test Reports no later than 21 calendar days after completion of the inspections or tests.

The Contractor shall perform, as a minimum, the following commissioning items.

- a. Delivery Inspection
- b. Verify correct unit installation by inspecting installed unit to manufacturer's installation drawings and instruction.
- c. Flush, check for contamination, and then pressure test fluid systems.
- d. Check pump motor rotation
- e. Check permissive sequences
- f. Certify grounding and shielding circuits
- g. Support the Test Support Contractor in verification of all instrumentation and controls interfaces. New alarm and trip adjustments shall be made and checked.
- h. Test mechanical operation and electrical settings of all breakers and disconnecting devices.
- h. Verify function and redundant operation of the cooling system.
- i. Verify function of remote control and monitoring PLC.
- j. Verify function of any local controls and monitoring devices.
- k. Verify harmonic distortion output of drive at PCC is within recommended limits of IEEE 519.
- l. Verify startup, acceleration, deceleration, and shutdown of the operating sequence.

4.3.5 Integrated System Tests

- 4.3.5.1 General: This phase starts the actual site commissioning of the integrated drive system. A performance test report shall document the findings of this section.

All initial tests shall be conducted at the lowest energy level required. The Government and the Contractor shall both agree as to when each phase has been completed, and the drive system is ready for the next level of testing.

The AEDC Test Support Contractor will provide a maximum of 10 hours of dedicated airtime to support testing the unit at full load conditions.

The contractor shall provide all labor and materials to repair, and adjust, where required, so that all system components operate and perform to design requirements during site acceptance test.

4.3.5.2 System Tests: This phase shall begin with the energization of the high voltage electrical feeder and activation of all equipment to rotate the drive motor. The motor shall be sequenced up to full speed, synchronized to the line, and transferred to the run bus. Demonstrate that the drive system and all auxiliaries are operating satisfactorily and eliminate all anomalies.

4.3.5.3 Mode Tests: This phase shall consist of starting the airside/exhaust motors using the Airside drive (Mode 2) and starting the airside/exhaust motors using the Exhaust side drive (Mode 3). Each drive shall demonstrate the ability to start all 18 motors within 80 minutes allowing two false starts and one minute time period between starts to set up for the next motor start. Also, following successful completion of Modes 2 and 3, each drive system shall demonstrate ability to provide continuous variable speed control/operation of one motor at a load less than or equal to 20MW.

4.3.5.4 Acceptance: The Contractor shall provide a test sequence to fully and unconditionally load the drive system to capacity and record system variables that prove the performance criteria of Section 3.2 has been met. The test program shall be for sustained periods until all system parameters have stabilized at each load condition prior to taking acceptance measurements.

5 PERSONNEL TRAINING

The Contractor shall be responsible for providing training of Government employees. The Contractor shall submit a Training Plan for Approval by the Contracting Officer.

The Contractor shall conduct the training program at the AEDC and provide all experienced and qualified personnel and relevant materials required to implement the training program. Approximately 15 Government representatives consisting of engineers, operators, and technicians will attend the training.

- 5.1 Content: The program shall be designed to train personnel in the operation, troubleshooting, and servicing of the complete drive system; including all auxiliary equipment required for complete system operation. The training shall occur after the drive system acceptance by the Government.
- 5.2 Facilities: The training will be conducted in the conference room provided by the government. One overhead projector will be provided for the Contractor's use. Hours for the training class shall be 8:00 AM to 3:00 PM, Monday through Friday, excluding holidays. The class shall be a minimum of 20 hours. The training days may not be consecutive and will be at the discretion of the government. The government reserves the right to Video tape the training sessions for future use and reference.
- 5.3 Materials: The training materials shall consist of lectures, videos, slides, and handouts that give an overview of the system operation, as well as detailed coverage of the unit's operation, power electronics and components, cooling systems, firing circuits, controllers, and software functions of the new equipment. Handout materials shall become the property of the Government, and the Contractor shall supply a minimum of 20 percent additional copies of the handouts as part of the training material package.
- 5.4 Software Training: The Contractor shall also provide in-depth training on the drive controller software programming. This training shall be provided at a government facility, conducted in the English language. The training program will be attended by a maximum of ten Government engineers and/or experienced technicians to familiarize the Government with the software control aspects of the equipment prior to commissioning.

6 FOLLOW-ON SUPPORT

- 6.1 Warranty Work: The Contractor shall provide trained and skilled personnel to repair the drive system equipment for the duration of the system's warranty period. The Contractor shall provide all manuals, spare parts, and test equipment required for warranty repairs.

The repair personnel shall be on call 24 hours a day, 7 days a week, and shall be accessible to AEDC within 36 hours.

- 6.2 Reconfiguration and Other Support: As part of the follow-on support, the Contractor shall provide up to 100 hours of technical support at AEDC for reconfiguration or other special maintenance needs of the drive system. This support shall be provided for up to twelve months after final acceptance and at no additional cost to the government..

The Contractor shall include one (1) preventative maintenance visits within the first 12 months after acceptance of the drive system. A second preventative maintenance visit shall be at least 12 months before the end of the warranty period. The inspections must be held at least 12 months apart. The work shall include the inspections as required in the Contractor's Preventative Maintenance Plan.

7. PREPARATION FOR DELIVERY

The contractor shall provide all preservation, packing, and packaging to assure safe delivery of the units to AEDC. The contractor shall also be responsible for all shipping costs to deliver units to AEDC.

8. APPENDIX

- 8.1 Appendix A – Reference Drawing List
- 8.2 Appendix B – Motor Torque/Speed Data
- 8.3 Appendix C – 1999 ETF C-Plant Water Quality Data

BBC drawings:

- | | | |
|----|--------------|---------------------------------|
| a. | HEIG 000 345 | Air/Exhaust Single line Diagram |
| b. | HEIG 000 349 | Air Side Equipment Layout |
| c. | HEIG 000 350 | Exhaust Side Equipment Layout |
| d. | HEIG 000 355 | Air Side Three Line |
| e. | HEIG 000 417 | Air Side Cable Layout |
| f. | HEIG 000 418 | Exhaust Side Cable Layout |
| g. | HEIG 000 363 | Air Side Bus Duct Layout |
| h. | HEIG 000 364 | Exhaust Side Bus Duct Layout |
| i. | HEIG 000 366 | Auxiliary Power Distribution |

Ferranti Packard drawings:

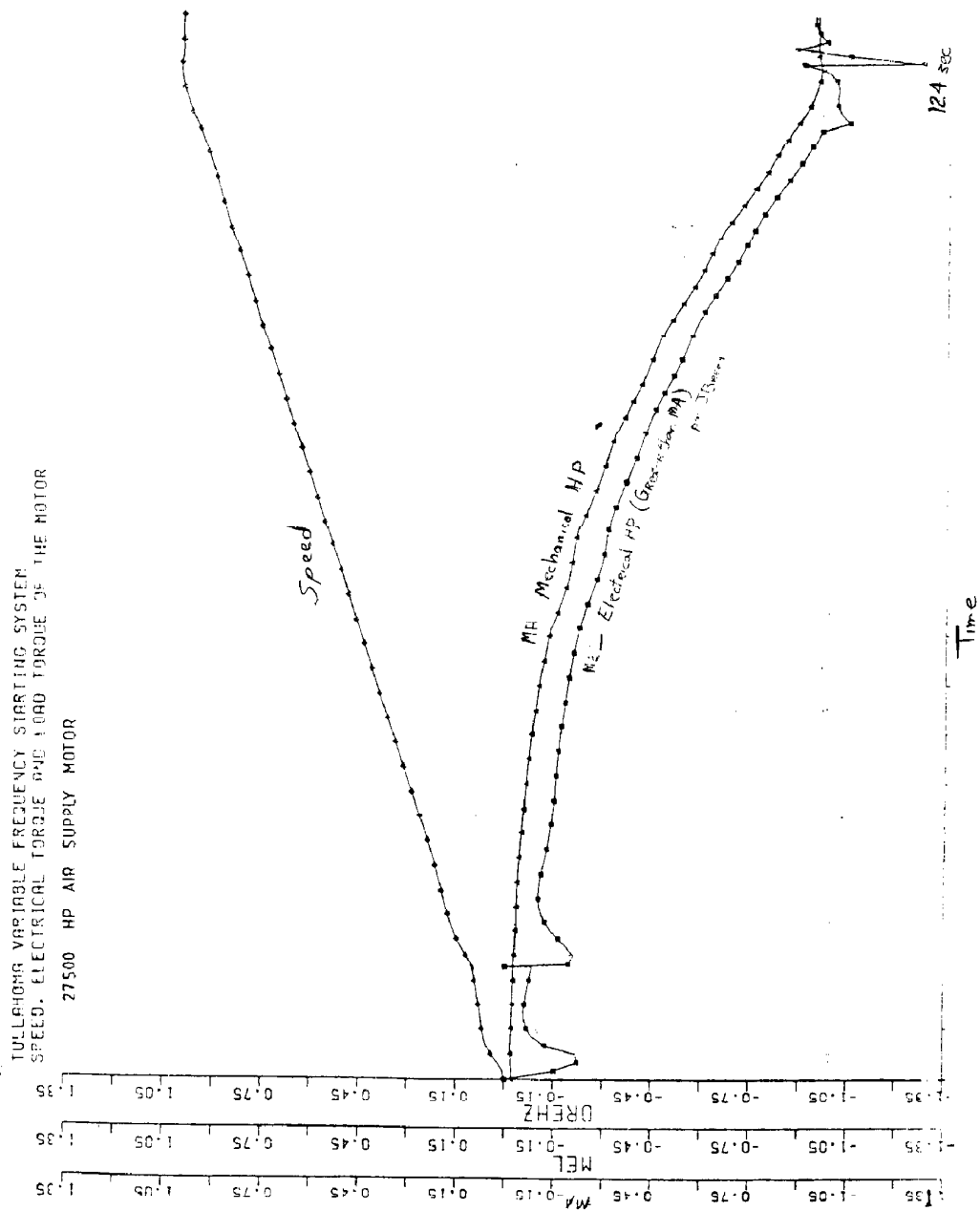
- | | | |
|----|--------|------------------------------|
| a. | 219462 | Input Transformer Nameplate |
| b. | 218777 | Output Transformer Nameplate |

DMJM drawings:

- | | | |
|----|-----------|--------------------------|
| a. | 4-20-M447 | Airside Piping Plan |
| b. | 4-20-M448 | Airside Piping Plan |
| c. | 4-40-M798 | Exhaust Side Piping Plan |
| d. | 4-40-M799 | Exhaust Side Piping Plan |

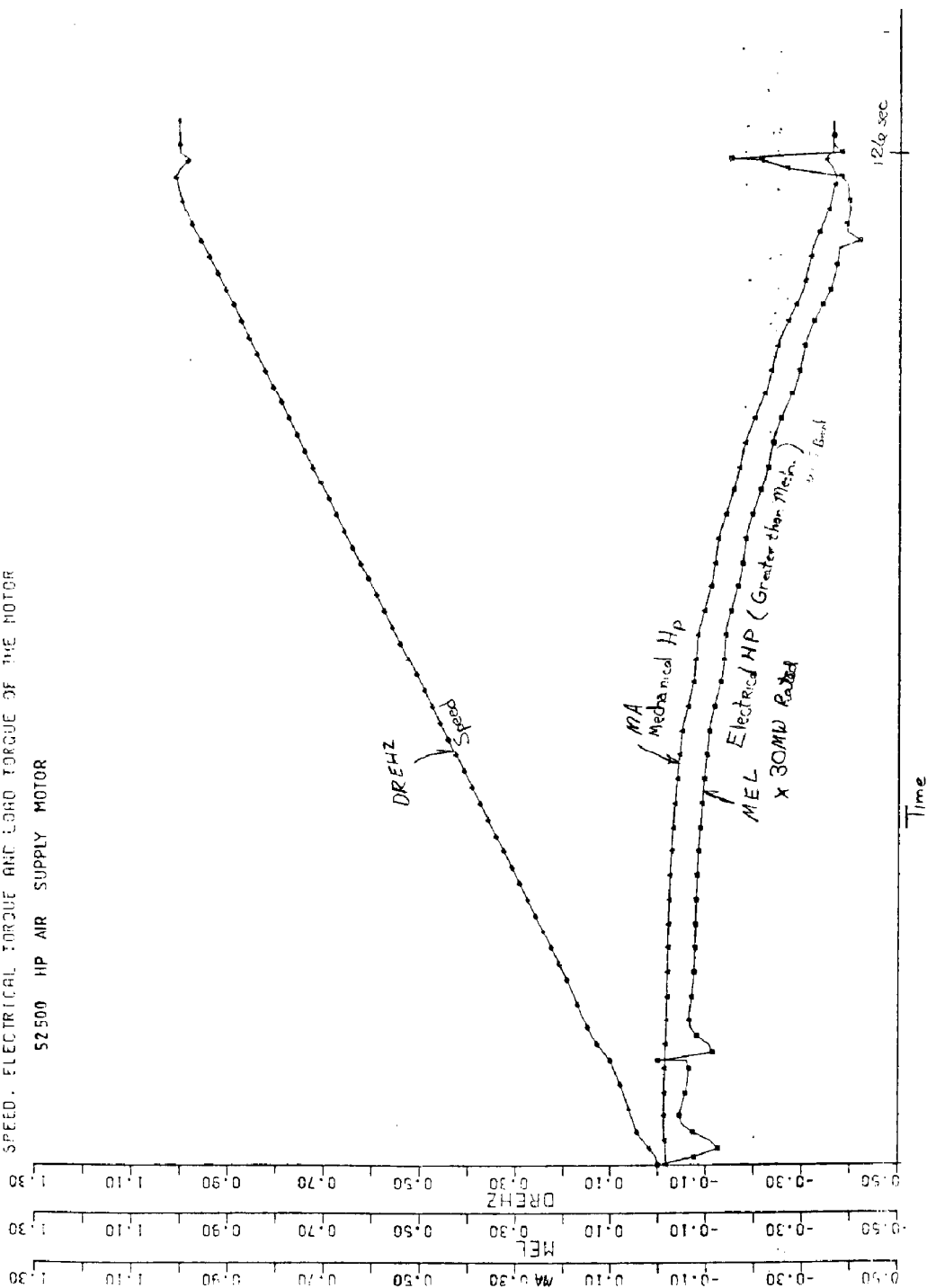
Appendix B

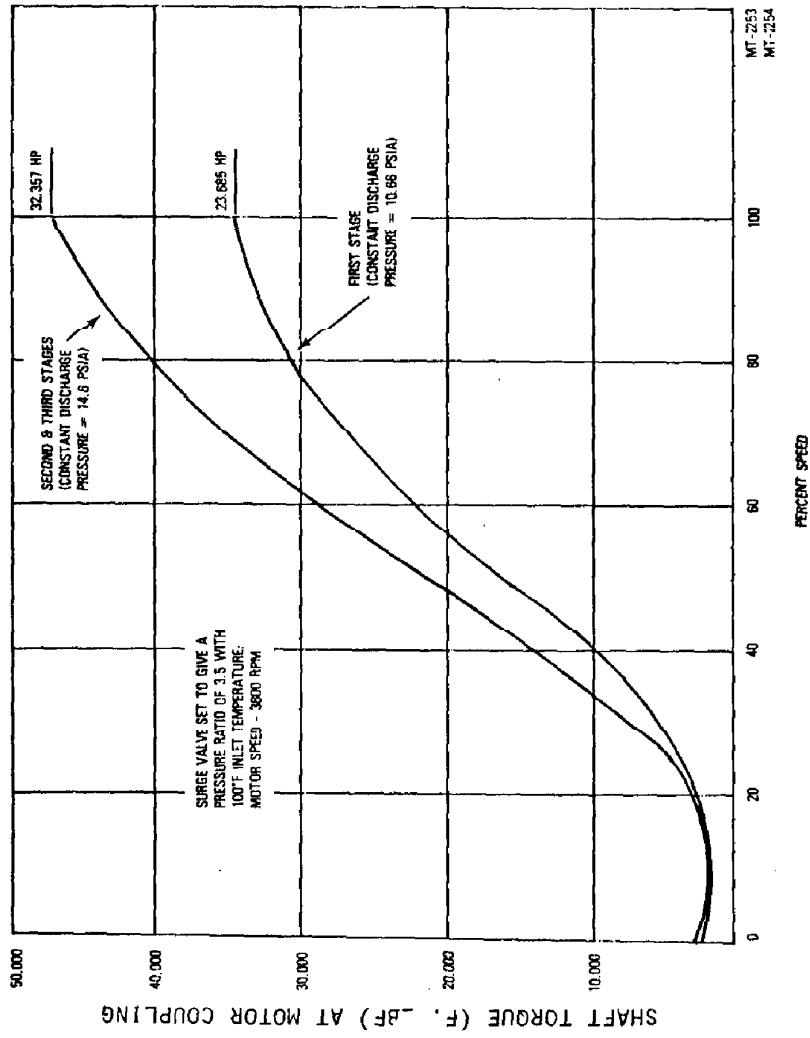
Motor Torque/Speed Data



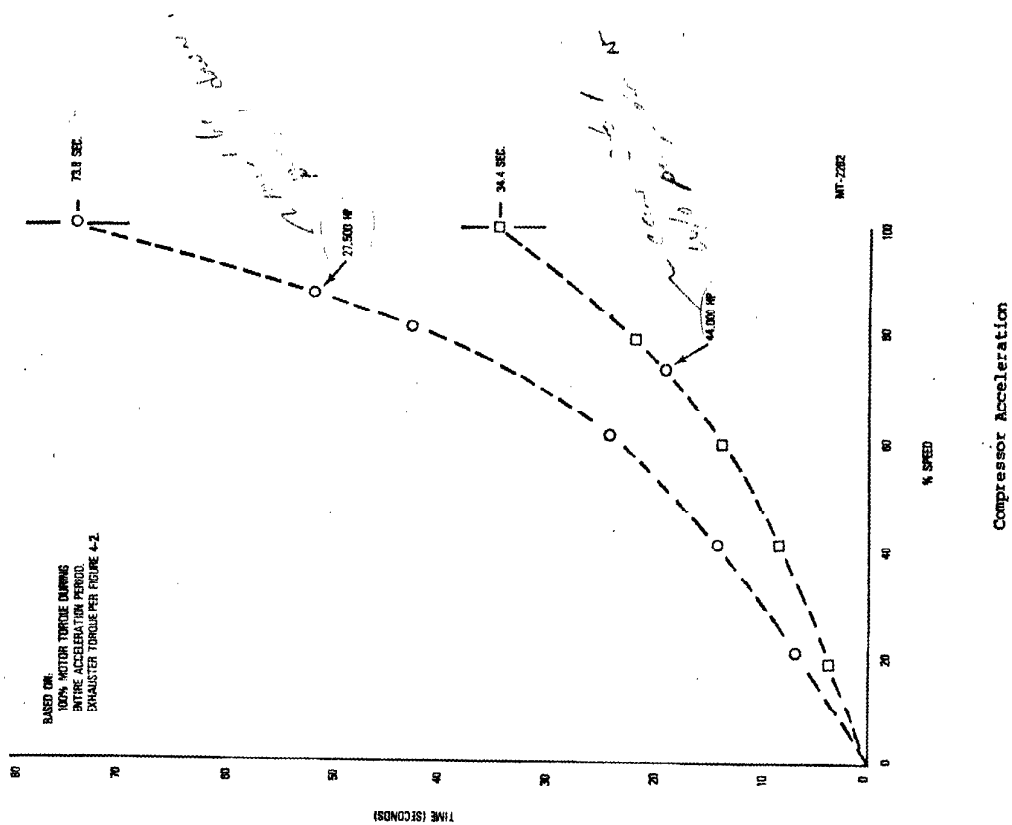
TULLAHOMA VARIABLE FREQUENCY STARTING SYSTEM
 SPEED, ELECTRICAL TORQUE AND LOBO TORQUE OF THE MOTOR

52500 HP AIR SUPPLY MOTOR





Shaft Torque Versus Speed



Date	Dissolved Oxygen, mg/l	pH (max)	pH (min)	Oil & Grease, mg/l	NH3, mg/l	CN, mg/l	Cl-, mg/l	Cd, mg/l	Cr, mg/l	Cu, mg/l	Fe, mg/l	Pb, mg/l	COD, mg/l	Total Suspended Solids, mg/l	Total Dissolved Solids, mg/l
1/7/99	8.1	8.51	8.45	<5	0.05	<0.005		<0.001	<0.01	<0.01		<0.002	3.69	4.9	109.7
1/8/99		8.51	8.31												
1/9/99		8.34	8.16												
1/10/99		8.37	7.81												
1/11/99		8.5	8.13												
1/12/99		8.5	8.39												
1/13/99	8	8.52	8.33	<5	0.05			<0.001	<0.01	<0.01		<0.002	2.5	4.1	103.5
1/14/99		8.23	7.78												
1/15/99		8.08	7.25												
1/16/99		8.19	7.43												
1/17/99		8.4	8.16												
1/18/99		8.11	6.82												
1/19/99		7.7	6.75												
1/20/99	7.8	7.91	6.63	<5	<0.05			<0.001	<0.01	0.0076		<0.002	1.08	70.4	100.7
1/21/99		7.98	7.39												
1/22/99		8.1	6.91												
1/23/99		8	6.95												
1/24/99		7.41	6.9												
1/25/99		7.24	6.62												
1/26/99		7.25	6.52												
1/27/99	7.6	7.11	6.52	<5	<0.05			<0.001	<0.01	0.0094		<0.002	2.375	8.7	102.7
1/28/99		7.05	6.6												
1/29/99		6.94	6.51												
1/30/99		6.78	6.52												
1/31/99		6.79	6.7												
2/1/99		7.38	6.58												
2/2/99		7.61	6.49												
2/3/99	8.2	7.56	6.5	<5.	<0.05	<0.005		0.0004	0.0033	0.006		<0.002	3	29.2	93.1
2/4/99		8.01	6.59												
2/5/99		7.38	6.47												
2/6/99		7.98	6.5												
2/7/99		7.87	7.3												
2/8/99		7.48	6.52												
2/9/99		7.95	6.7												
2/10/99	8.4	7.53	6.55	<5.	<0.05			<0.0002	<0.0006	<0.0011		<0.002	3.275	92.8	103.1
2/11/99		7.67	6.49												
2/12/99		6.8	6.57												
2/13/99		6.9	6.51												
2/14/99		6.9	6.5												
2/15/99		7.88	6.46												
2/16/99		6.96	6.48												
2/17/99	8.2	6.96	6.5	<5.	<0.05			0.0008	<0.0006	<0.0011		<0.002	2.805	6.5	94.1
2/18/99		7.49	6.67												
2/19/99		7.04	6.51												
2/20/99		7.05	6.67												
2/21/99		7.17	6.67												
2/22/99		6.89	6.5												
2/23/99		6.97	6.56												
2/24/99	9.6	7.16	6.47	<5.	<0.05			0.0003	<0.0006	<0.0011		<0.002	2.765	66	104.5
2/25/99		6.95	6.52												
2/26/99		7.11	6.54												
2/27/99		7.99	6.71												
2/28/99															
3/1/99		8.2	7.92												
3/2/99		8.26	7.66												
3/3/99	7.2	8.08	7.81	<5	<0.05			<0.001	<0.01	<0.01		0.003	2.715	7.1	100.9
3/4/99		8.21	7.85												
3/5/99		7.81	7												
3/6/99		8.2	6.74												
3/7/99		8.31	8.05												
3/8/99		8.3	8.11												
3/9/99		8.24	8.07												
3/10/99	7.3	8.3	8.08	<5	<0.05			<0.001	<0.01	0.0269		<0.002	0.44		
3/11/99		8.3	6.68												
3/12/99		8.21	6.49												
3/13/99		8.05	6.55												
3/14/99		7.94	7.87												
3/15/99		8.14	7.88												
3/16/99		8.24	7.29												
3/17/99	7.4	7.81	6.77	<5	<0.05			<0.001	<0.01	<0.01		<0.002	0.075		
3/18/99		8.04	7.28												

5/30/99		7.6	7.3											
5/31/99		7.42	7.21											
6/1/99		7.88	7.75											
6/2/99	7.4	7.98	7.7 <5	<0.05			<0.001	<0.01	0.009		<0.002	1.385	40.65	112.9
6/3/99		8.53	7.83											
6/4/99		8.54	8.15											
6/5/99		8.54	8.02											
6/6/99		8.37	7.9											
6/7/99		8.39	7.85											
6/8/99		8.49	8.06											
6/9/99	7.8	8.51	8.02 <5	0.07			<0.001	<0.01	<0.01		0.004	1.375		
6/10/99		8.41	7.58											
6/11/99		7.96	7.61											
6/12/99		8.05	7.69											
6/13/99		8.23	7.57											
6/14/99		8.05	7.81											
6/15/99		8.43	7.56											
6/16/99	7.2	8.21	7.8 <5	0.09			<0.001	<0.01	0.0113		<0.002	5.85		
6/17/99		8.37	7.66											
6/18/99		7.3	6.94											
6/19/99		7.32	7.08											
6/20/99		7.63	7.09											
6/21/99		8.54	7.62											
6/22/99		8.44	8.04											
6/23/99	7.4	8.31	7.99 <5	<0.05			<0.001	<0.01	<0.01		0.003	2.835		
6/24/99		8.07	7.71											
6/25/99		8.41	7.53											
6/26/99		7.74	7.39											
6/27/99		7.98	7.37											
6/28/99		7.82	7.3											
6/29/99		8.23	7.33											
6/30/99	7.4	8.39	7.56 <5	0.11			<0.001	<0.01	<0.01		<0.002	2.83		
7/1/99		7.67	7.33											
7/2/99		7.74	6.85											
7/3/99		7.9	7.14											
7/4/99		7.85	7.46											
7/5/99		7.99	7.65											
7/6/99		8.5	7.65											
7/7/99	7.4	8.51	7.52 <5	<0.05			<0.001	<0.01	<0.01		0.005	2.655	12.4	110
7/8/99		8.39	7.78											
7/9/99		8.01	7.59											
7/10/99		8.09	7.66											
7/11/99		7.72	7.58											
7/12/99		8.17	7.56											
7/13/99		7.72	7.44											
7/14/99	7.6	8.35	7.52 <5	0.16			<0.001	<0.01	<0.01		<0.002	2.05		
7/15/99		8.44	7.81											
7/16/99		8.54	7.92											
7/17/99		8.52	7.93											
7/18/99		8.53	7.82											
7/19/99		8.38	8.18 <5.0		<0.02									
7/20/99		8.49	8.01											
7/21/99	6.2	8.47	7.81 <5	<0.05			<0.001	<0.01	<0.01		0.004	2.13		
7/22/99		8.47	7.78	<0.05			<0.001	<0.01	<0.01		0.004			
7/23/99		8.52	7.98											
7/24/99		8.36	7.92											
7/25/99		8.14	7.72											
7/26/99		8.12	7.82											
7/27/99		8.45	7.86											
7/28/99	6.4	8.51	7.82 <5	<0.05			<0.001	<0.01	<0.01		<0.002	1.715		
7/29/99		8.19	7.74											
7/30/99		8.49	7.71											
7/31/99		8.52	7.96											
8/1/99		8.33	8.03											
8/2/99		8.21	7.97											
8/3/99		8.47	8											
8/4/99	6.8	8.52	8.03 <5	<0.05			<0.001	<0.01	<0.01		<0.002		5.2	121.4
8/5/99		8.41	8.01								2.345			
8/6/99		8.3	7.97											
8/7/99		8.39	8.02											
8/8/99		8.3	8.06											
8/9/99		8.46	8.03											

[illegible]

ATTACHMENT 2: PERFORMANCE INFORMATION

Provide the information requested in this form for each program being described. Provide frank, concise comments regarding your performance on the contracts you identify. If more space is required, continue on the back of form or on one continuation sheet.

A. Offeror Name (Company/Division):

B. Program Title:

C. Contract Specifics:

1. Contract Number _____

2. Contract Type _____

3. Period of Performance _____

4. Original Contract \$ Value _____

5. Current Contract \$ Value _____

6. If Amounts for 4 and 5 above are different, provide a brief description of the reason:

7. Voltage and Power Size: _____

8. Type of Device (LCI, PWM, Cycloconverter, etc): _____

9. Type of Load (e.g. 4- 13.8KV Motors)

D. Completion Date:

1. Original date: _____

2. Current Schedule: _____

3. Estimate at Completion: _____

4. How Many Times Changed: _____

5. Primary Causes of Change: _____

E. Primary **Customer** Points of Contact:

(Please provide current information on both individuals)

Program Manager:

Contracting Officer:

Name: _____

Office _____

Address _____

Telephone _____

F. Subcontracting Goals

Identify If A Small Business Or Disadvantaged Business Subcontracting Plan Or Goal Was Required. If So, Identify In Terms Of A Percentage The Planned Versus Achieved Goal During The Contract. If Goals Were Not Met, Please Explain.

G. Brief Description of Effort as __Prime or __Subcontractor

Highlight portions considered most relevant to current acquisition, including similar problems/risks that were encountered.

H. Brief Description of Project Organization

Identify whether effort was performed with in-house resources, subcontractors, teaming arrangement or other multi-company organization and identify any major subcontractors/teaming partners. Describe your role in the integration of the design/fabrication/installation effort.